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... front porch, and sync timings).

PC FACT FILE
EDITOR'S CHOICE

Graphics Engine
NEC Technologies Inc., 1255 Michael Dr., Wood Dale, IL 60191, (708) 860-9500
List Price: $1,499
Requires: 14 or higher-resolution monitor, board with built-in VGA, programmable to accept a wide ... installed and ... documentation, this is ... application.

READER SERVICE CARD

APRIL 10, 1990 PC MAGAZINE 163

accelerator software to dramatically boost the speed of Windows and Presentation Manager applications, ...

NEC

The supe
MultiSyn

The Bottom Line If you use high-resolution graphics and windowing environments, NEC's monitors won't disappoint.

NEC MULTISYNC 4D

The user-friendly Swiss army knife of multiscanning monitors, the NEC Multisync 3D displays bright, true colors and very sharp text and graphics. All controls are conveniently mounted up front, including microprocessor controlled push buttons for manually adjusting screen size. T... are ...

Bearing this in mind, our top pick ... the products reviewed here is the NE Multisync GS2A. It has an opinion ... higher resolution than the ... and t NEC's large, flat screen ... ing with superior glare protection. T higher resolution means ... comes with the ...

Seldom does a company dominate a market the way that NEC does with multiscanning monitors, and its latest innovations show why.

That hasn

... The Multisync 3D, which includes a 9-pin and 15-pin video cable, is the best of the multiscanning monitors we tested.

PC FACT FILE
EDITOR'S CHOICE

NEC MultiSync 4D
NEC Technologies Inc., 1255 Michael Dr., Wood Dale, IL 60191, (708) 860-0336
List Price: $1,699 (cable included)
Requires: VGA, Super VGA, 8514/A, or 1,024 x 768 graphics adapter
Diagonal Screen Size: 16 in.
In Short: The 16-inch NEC MultiSync 4D is the lowest-priced monitor in the MultiSync line to ... 1,024-by-768 noninterlaced resolution. It ... in its digital memory.

READER SERVICE CARD

CORPORATE PC WEEK SATISFACTION POLL

A BEST-TO-SELL WINNER
MONITOR: NECHE MULTISYNC 2A
With high-performance ... quality and reliability may be ... important than price. And wi ... many graphics standards but t ... software compatibility is a big ... The MultiSync 2A 14-inch color m ... tor from NEC Home Electro ... (U.S.A.) delivers on all counts.

By moving graphics screens at a blistering pace, the Graphics Engine brings improved performance to desktop publishing, CAD, and other graphics applications and ...

The 4D's ap
elegant in the e

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...ons

onitors Look to the Future

lays of NEC's new
nd 5D monitors por-

MultiSync 5D offers simil

NEC MultiSync 3D

BEST BUY

PROS: Supports all boards, "remembers" screen adjustments, 28mm dot pitch

The Bottom Line The MultiSync Graphics Engine has the power to put Windows or PM into the mainstream.

Overall, the NEC MultiSync Graphics Engine is powerful, versatile, and fast—it is a perfect match either for an NEC monitor or for the high-resolution monitor of your choosing.

MultiSync 2A, MultiSync 3D

"Works Better!"
"Looks Great!"

. I'd take the crisp NEC over the fuzzy IBM image any day.

[redacted]

een said.

If you want a monitor for VGA level and up, the NEC MultiSync 4D is an excellent choice.

Buyers of NEC's MultiSync 2A awarded that monitor the highest scores in the four top-ranked attributes—it

ch to storing settings is
me.

FINALISTS
NEC MultiSync 3D, 4D, and 5D monitors

■ Jerry Benson, Tom Grau, Wayne Hinson, Keith Schaefer
■ NEC Home Electronics (U.S.A.) Inc., 1255 Michael Dr., Wood Dale, IL 60191; (312) 860-9500

NEC got out in front first with the MultiSync—and stayed there. The 3D, 4D, and 5D monitors are significant additions to the MultiSync family. They add digital controls and automatic recall of user preferences for each video mode to a product line that's already won the Award for Technical Excellence and numerous Editor's Choices. The 4D monitor takes multiscanning into a new dimension: the 16-inch tube may prove to be the perfect size for high-resolution color work in cramped offices.

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PC WORLD

You don't have to use Windows to appreciate the 270 products showcased in our fourth annual Hardware Special Issue. But if you're planning to emigrate to Windows, you won't find a better guide to smart hardware selection than the one starting on page 148.

Cover photograph by Robert Lorenz

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When it comes to business graphics, the newest version of Borland's *Quattro Pro* outshines all the competition. And it's as impressive a spreadsheet as ever.

99 **SX Notebooks Hit 20 MHz** ..... *Michael Goodwin*
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105 **Word 5.5's Big Risk: A Top-to-Bottom Make-Over**
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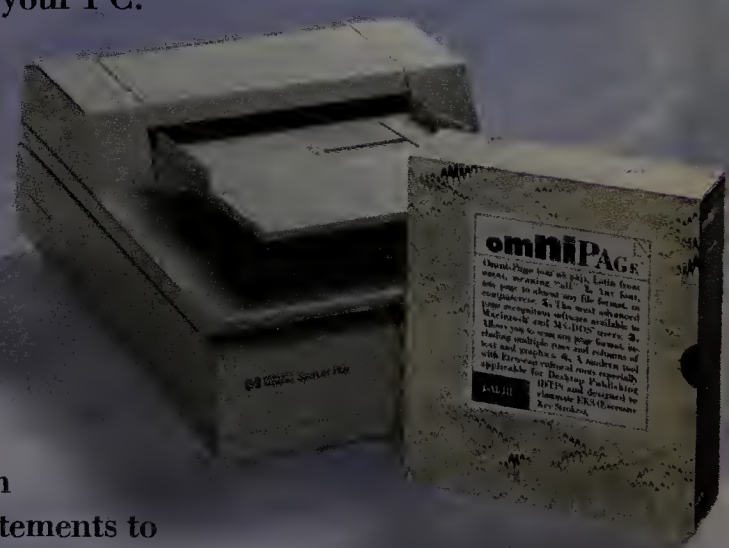

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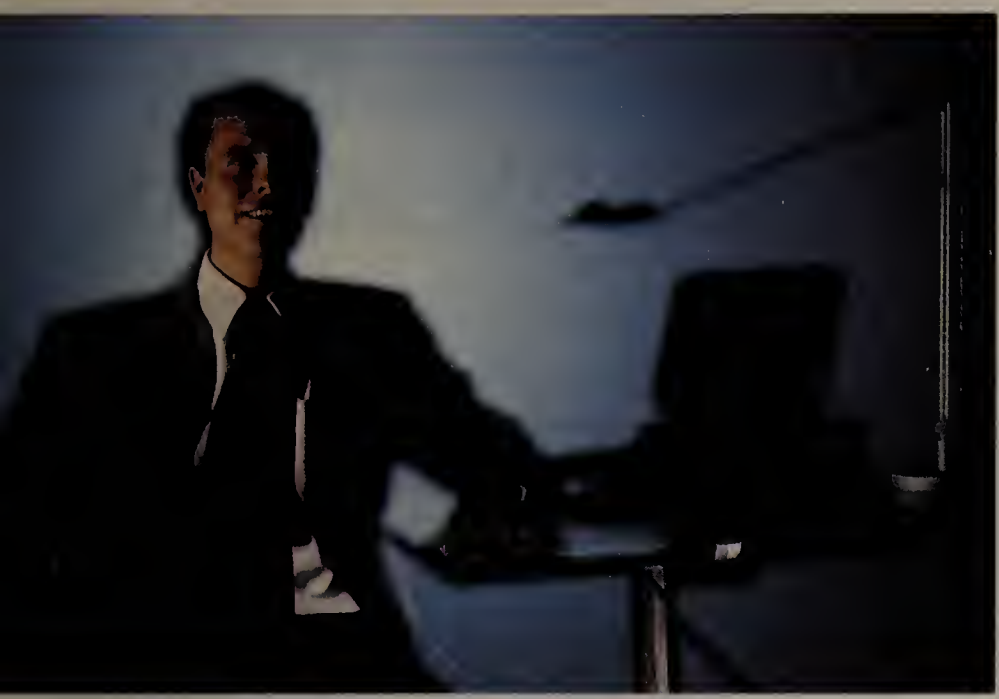
Circle 260 on reader service card



ROBERT CARDIN

Eric Knorr to the Fore

This issue marks Eric Knorr's debut as editor of PC World.

Eric Knorr—the *K* is silent, like the powdered soup mix—is a fanatic. He's not dangerous, but he is obsessive—he's driven by a compulsion to find out everything there is to know about PC hardware and technology. And you, our readers, stand to benefit from Eric's quest, because this issue marks Eric's promotion to editor of *PC World.*

No one's sure when Eric's attraction to hardware and technology first surfaced. We do know that it was already quite developed by the time he joined the editorial staff of a slim film and video magazine called *Moving Image* in the early eighties. In 1985, Eric found his way to *PC World.* Soon after arriving, he introduced the concept of a special hardware issue and established himself as the staff expert on graphics hardware. More important, he seized every opportunity to push *PC World*'s mission to the limit. To Eric, that mission can be described in one word: *clarity.* He doesn't mean just clear writing; he means clear everything. At story meetings, for example, Eric exhorts assigning editors to defend their proposals by articulating the benefit for the reader. If a staffer's explanation doesn't measure up, Eric jumps right in. "It's not *clear,*" he'll say. "Let's talk about how to focus this concept."

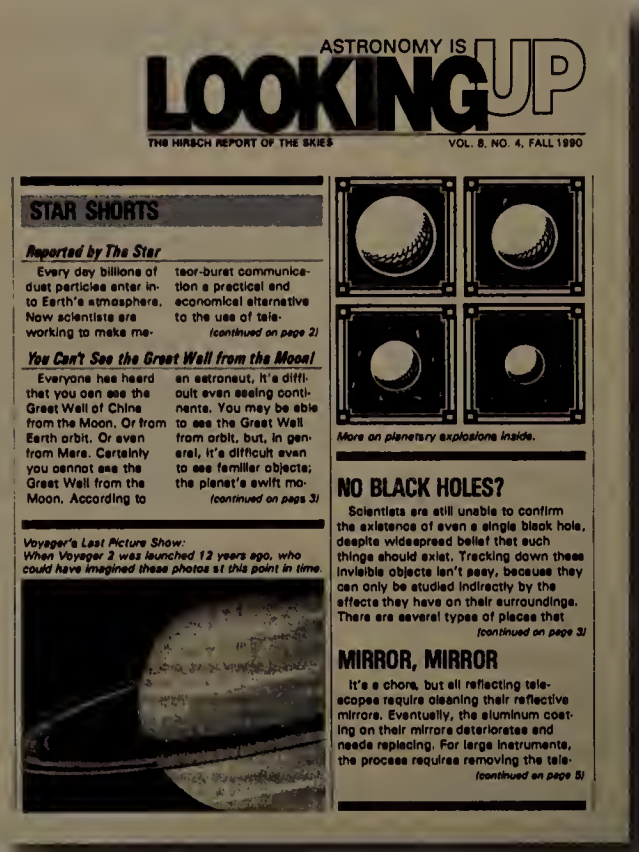
Eric's emphasis on clarity and his innate passion for PC hardware are great assets in his new job. But they alone do not qualify him for the position of editor. Nor was he promoted because of his management and communications skills, his history of 12-hour workdays, or his softly spoken but wry and always appreciated sense of humor. These and other traits and skills are not trivial; they are essential. But the main reason Eric Knorr was named editor was his uncompromising devotion to your needs and interests. Whether he's making time to represent *PC World* reader perspectives by participating in VESA (the Video Electronics Standards Association), sitting down with our infographics specialist, Jeff Glines, to fine-tune a diagram, or critically inspecting some new hardware device, Eric Knorr knows he works for one master, the reader. This has always been true of the best editors. And it has always been true of Eric Knorr.

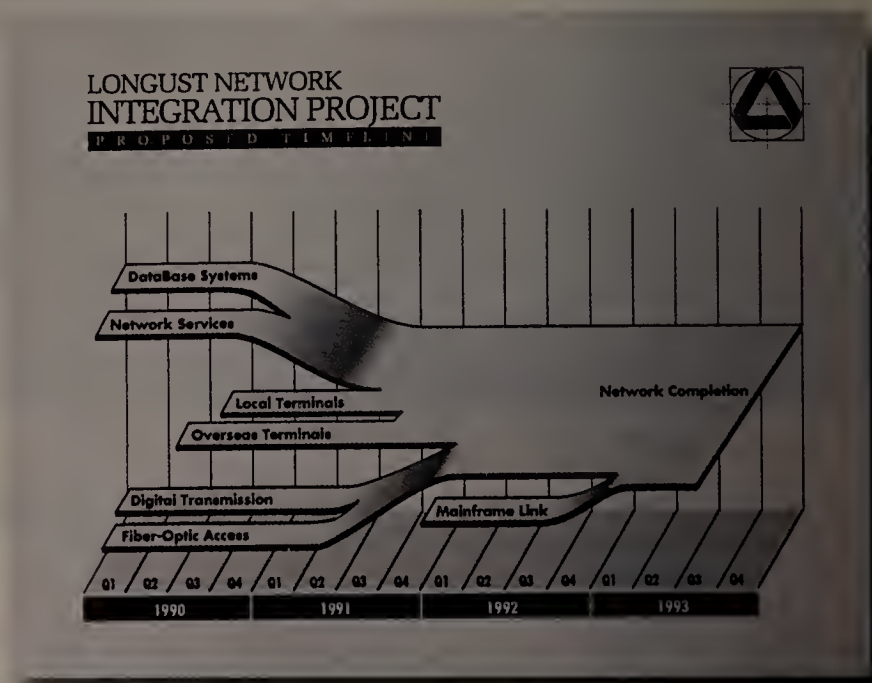
What have Eric and his colleagues wrought in this special issue? No surprise: mainly hardware (though with the usual front-and-back battery of product news, technology trends, management advice, and hands-on technical assistance). All of the durables featured here are particularly suited to running *Windows,* which is not to say their usefulness is limited to *Windows.* The roundup of new 25-MHz small-footprint 386 systems, for example, will appeal to anyone who values compactness but doesn't want to sacrifice performance. Ditto the seven SX laptops reviewed. Just about everyone is interested in output, whether this refers to how applications look on the monitor or how work looks when printed. Our Buyers' Guides address both angles, with monitors and boards that outshine VGA, plus LaserJet II compatibles. You'll also find a review of six networkworthy PostScript printers.

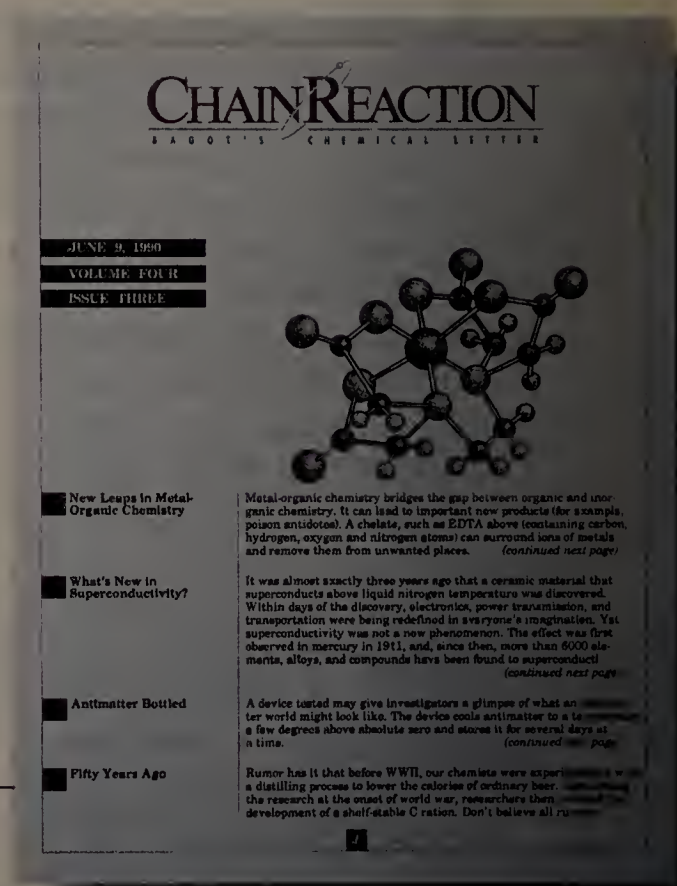
I hope you enjoy this fourth annual Hardware Special Issue. I know it's just the beginning of many good and useful things from *PC World* editor Eric Knorr.

Richard Landry
Editor in Chief

If you think the HP LaserJet III is great,







Introducing the new HP LaserJet IIID printer. The LaserJet that combines all of the advanced capabilities of the exciting LaserJet III with all of the paper-handling features required by today's busy office.

There's a lot to like. Like two paper trays for different types and sizes of paper. 200-sheet capacity in each of those trays for less reloading. And two-sided printing that lets you easily condense your output. Even an optional automatic envelope feeder that eliminates manual feeding.

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Documents can be made even more elaborate thanks to our en-

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HEWLETT PACKARD

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It's easy to see why LANtastic™ PC Network sales have skyrocketed – enough for 39th in *Inc Magazines* "Inc 500".

PC MAGAZINE EDITORS' CHOICE May 29, 1990 LANtastic

Linking anywhere from two to 300 PCs, it lets users share disks, files, databases, programs and printers. So they zoom through their days by replacing time consuming legwork with a few simple keystrokes.

PC WORLD BEST BUY

And while LANtastic was designed to turbocharge productivity, it was also designed to fit comfortably inside limited budgets. For as little as $252* per PC – software *and* adapters – it delivers a hefty price-performance payload: Disk caching to boost speed. E-mail to cut paper trails. Security to stop space invaders. Audit trails to track network activity. Multiple printer sharing. Voice mail options. Just to name a few.

LAN TIMES RECOMMENDED NETWORKING

PC MAGAZINE EDITORS' CHOICE March 28, 1989 LANtastic

So whether you run LANtastic AE-2 Ethernet adapters, LANtastic 2Mbps adapters or others, you get a tremendous amount of LAN bang for the buck.

No wonder LANtastic sales have skyrocketed making it not only an Editors' Choice but a people's choice as well.

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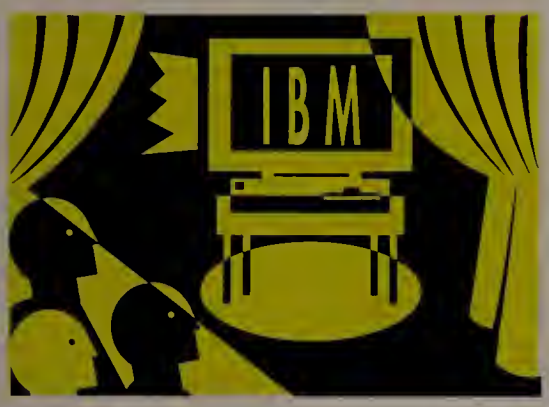
Circle 6 on reader service card

IBM SHIPS 486s

Downsized OS/2, Graphics Standard Debut



IBM rolled out its first full-blown 486-based PCs in late October along with a downsized version of OS/2 and a faster, higher-resolution graphics adapter intended to replace VGA (see "IBM Pushes Graphics Higher"). Although appearing later than similar entrants from clone makers, IBM's 486 tower and desktop models run the most demanding applications.

Designed for network service and other power-hungry jobs, the Model 95 XP 486 combines Intel's most powerful CPU with fast I/O and an unusual amount of expansion room. The tower comes in 33-MHz and 25-MHz versions and ships with 4MB of memory (expandable to 32MB on the system board) and a 256K memory cache option. The system has six available 32-bit Micro Channel slots and a cached SCSI adapter and holds up to five internal disk drives of 80MB, 160MB, or 320MB capacity. A desktop version, the Model 90 XP 486, offers three available slots and takes three internal drives.

All models are scheduled to ship in November, but prices were not available at press time. Also missing was IBM's "Super Server," the dual-processor network server shown in prototype for a year, and a long-awaited laptop. IBM still hasn't produced a sub-20-pound portable, although several competitors sell 20-MHz 386SX notebooks.

However, IBM did release the much-discussed OS/2 1.3, which works up to 25 percent faster than earlier versions. The Presentation Manager alternative to Microsoft's *Windows 3.0,* OS/2 1.3 can run one DOS and two OS/2 applications in as little as 2MB of memory. It's the first major PC environment to provide true WYSIWYG fonts—bundling in *Adobe Type Manager* for the same scalable PostScript fonts on both screen and printer. The release also sports a friendlier interface.

IBM PUSHES GRAPHICS HIGHER

XGA Seen as Replacement for Popular VGA

IBM wants to replace its VGA graphics adapter with a faster, higher-resolution Extended Graphics Array (XGA) designed with graphic environments such as *Windows* in mind. IBM hopes to avoid the mistakes made with the 8514/A high-end adapter by offering a cleaner design and, more important, publishing hardware specifications so other suppliers will rally around to create a broad standard.

XGA hardware will first appear in Big Blue's new 486 machines. Unlike the 8514/A, XGA will be built into the motherboard and will work with noninterlaced monitors, which don't have the flicker problem that plagues interlaced displays. XGA runs VGA software faster and supports 256 colors at 640 by 480 VGA resolution and 16 colors at 1024 by 768 (or 256 colors with added memory). A special 16-bit color mode allows 65,536 colors on screen. XGA enhances *Windows,* OS/2, graphics, engineering, and desktop publishing software. It's also "a necessary and strategic product for IBM's multimedia plans," says Dataquest analyst Michel Castro.

While VGA is enormously popular, the 8514/A (which debuted alongside VGA three years ago) remains an expensive specialty. Its sophisticated silicon is very hard to clone, and few suppliers did. With only IBM supporting 8514/A before this year, the hardware stayed pricey, and software developers passed it by. "It was a bomb," concludes International Data Corporation analyst Joan-Carol Brigham. If IBM releases XGA specs, Castro predicts, "XGA's potential is 10 or 20 times as great."

XGA will work with IBM's 8515 and selected other monitors. It should support all applications written for *Windows,* OS/2 Presentation Manager, and the 8514/A's software interface, plus selected other packages. Its strongest competition will come from Texas Instrument's 340XX adapter chip set, which has been backed by Compaq and many board suppliers.

GORDON STUDER

IBM SHOWS INK JET

Wide-Carriage Model First in Series

IBM has introduced a wide-carriage ink jet to provide an upgrade path into nonimpact technology for its dot matrix customers. The $1099 ExecJet is billed as a replacement for wide-carriage, 24-pin dot matrix printers that are primarily dedicated to spreadsheet applications.

But like Epson, whose wide-carriage EPI-4000 serves CAD users who need quick drafts, IBM doesn't intend to stop there. The ExecJet reflects IBM's intention to develop an ink jet business without competing head-on right away with Hewlett-Packard's popular DeskJet series.

Both IBM and Epson are making forays into a market that will bloom as users adopt color printers for desktop publishing and other graphics-oriented applications.

In the short term, the laserlike print quality of the ExecJet (with 360-dpi resolution and 18 resident bit-mapped fonts) makes it a good candidate to steal sales from 24-pin dot matrix printers. But in the long run—given fast-falling prices for laser printers—desktop color is the most promising avenue of growth for ink jets. Personal laser printers from Hewlett-Packard, Epson, and others are now priced as low as $850 on the street. Users are turning to these alternatives so rapidly that InfoCorp recently revised its projections for 1990 U.S. ink jet printer shipments down 41 percent to 430,000 units.

AMD CLONES 386

Intel Rival to Supply 386 and 386SX Work-Alikes

Computers using Advanced Micro Devices (AMD) clones of Intel 386 processors may appear during the first half of 1991, ultimately helping to bring down system prices. AMD has been emboldened by an initial ruling on its claim that Intel breached a 1982 technology-sharing agreement between the pair. AMD already has given samples of its Longhorn (386) and Shorthorn (386SX) processors to PC makers. Spokesman John Greenagle says it plans volume production by year-end—following resolution of a brand name conflict.

AMD asks that Intel pay it $600 million and affirm its right to clone the 386 and subsequent generations. But Intel vice president and general counsel Thomas Dunlap maintains that the arbitrator's finding suggests that it won't have to share chip technology with AMD. So Intel's likely recourse against AMD 386 clones would be another lawsuit. The courts will be sorting out the monetary issues long after AMD ships 386 chips, predicts Michael Slater, publisher of the *Microprocessor Report*.

More important for users and PC suppliers, says Slater, is a second suit AMD filed earlier this year to affirm its rights to Intel microcode. If it wins, AMD could more easily clone Intel parts with 100 percent compatibility. AMD executives admit that Longhorn and Shorthorn parts already employ that microcode.

AMD now claims more than 50 percent of the worldwide 286 market, a share garnered largely by price cutting. AMD could drag down 386 prices as well, says Slater, but initially it will simply help make up a shortfall in Intel's 386 supply. AMD has also announced the AM286ZX, the first chip to put almost all of a computer's basic components on a single piece of silicon, which makes possible motherboards as small as 4 by 6 inches.

EPSON OFFERS POSTSCRIPT

Adobe Signs Up Licensees, TrueType Is Delayed

Epson America has become the latest big name to produce an inexpensive laser printer with Adobe's PostScript page description language (PDL). Scheduled for January shipment, Epson's EPL-7500 is a 6ppm printer with 35 scalable fonts. Product Manager Carolyn Perrier says it will be priced under $3500, making it competitive with PostScript models unveiled recently by Texas Instruments, Apple, NEC, and QMS.

The EPL-7500 is one of two new releases with a Minolta engine (rather than the TEC engine of Epson's Hewlett-Packard IIP-compatible EPL-6000). It includes a 16-MHz RISC-based controller of Epson's own design and accommodates a 250-sheet paper tray with room for a second tray under the printer. It comes with 2MB of memory and can reach 6MB with the use of a daughterboard.

A near-identical second release, a LaserJet II compatible called the EPL-7000, can be upgraded to the EPL-7500 just by replacing its controller with a PostScript upgrade and adding the necessary memory for page description. The sub-$1500, 14-font EPL-7000 ships with 512K of memory, upgradable in half-megabyte increments to 2MB.

After nearly five years of being limited to the highest-priced devices, Adobe's PDL standard suddenly can be found even on personal lasers. "Adobe is getting more and more aggressive with licensing," explains Epson's Perrier. "It realizes that it is going to have competition from not only [Microsoft's] TrueImage but more PostScript clones as well."

Adobe won't have to face Microsoft's TrueImage/TrueType PDL/font-scaling technologies for a while. Although Microtek and LaserMaster announced TrueImage printers in September, broad support for the associated TrueType font scaling (originally slated to debut with the printers) won't appear until mid-1991 with *Windows 3.1*.

386SX NOTEBOOKS DEBUT

Toshiba, AST Offer Fast CPUs, Low Prices

Toshiba America and AST Research will add to the flood of 386SX, 286, and even 8086 notebooks debuting at Comdex/Fall in November. The 386SX offerings from both system leaders give users 32-bit power and VGA graphics but trade advanced options like expansion units—and CPU speed, in Toshiba's case—for low prices.

While AST's Premium Exec 386SX/20 is a 20-MHz entry comparable to the just-announced Texas Instruments and Compaq systems (previewed in this issue), Toshiba's T2000SX, like Epson's new NB3 notebook, is driven by a 16-MHz 386SX.

The Premium Exec is 6.5 pounds and measures 11.4 inches wide by 9 inches deep by 2.5 inches tall. The 6.7-pound T2000SX measures 12.2 by 10 by 1.9 inches. Both come with 3½-inch internal floppies and 40MB drives. Toshiba prices were not set at press time, but AST's $3395 40MB system is available in a 20MB version for $2995—the closest comparable configurations from Compaq and Texas Instruments cost about twice as much.

All models are equipped with 2MB of memory and VGA-quality backlit LCDs and employ extensive power management tricks. The Premium Exec is a little thicker than most, says AST portable marketing director Genelle Trader, because it employs size D nickel-cadmium batteries rather than the usual size Cs.

Toshiba's solution to the 386SX/VGA power-draw problem is to include the first nickel-hydride batteries in a portable. Toshiba product marketing director Tom Sherrard puts the battery life of the T2000SX at 3 hours. The ASTs achieve battery life of 3½ to 4 hours, says Trader. All these machines can quickly recharge in 3 hours.

AST also is debuting the 12-MHz Premium Exec 286/12 in 20MB ($2495) and 40MB ($2895) versions, which can be upgraded to a Premium Exec 386SX/20 for under $700. At the low end, Toshiba is introducing the 8086-based T1000LE with both 3½-inch floppy and 20MB hard drives for $2499.

GORDON STUDER

IN ATLANTA, GEORGIA...

AT THE GRAND CANYON IN ARIZONA...

AND IN ZURICH, SWITZERLAND...

GATEWAY2000

"You've got a friend in the business."

People the World Over

Everywhere you look these days you'll find Gateway 2000 computers. That's because people everywhere know a good value when they see one. In all 50 states and in over 70 foreign countries, thousands of people are comparing price, quality and service – and choosing Gateway 2000.

In Atlanta...

ZSoft, the well-known graphics software company, often demonstrates its software at trade shows on Gateway 2000 computers. Dave Steier, ZSoft code librarian and software demonstrator, said he prefers showing products on Gateway systems. "They're terrific," Dave remarked. "I just got back from a show where I was using Gateway 33's and they're screamers." Don Womick, Jr., a programmer for ZSoft, bought a Gateway 2000 20 MHz 386 for his personal use because he liked the Gateway systems at work. "With Gateway," said Don, "I was able to get the performance I need at a price I could afford."

ZSoft employees Dave Steier, left, and Don Womick, Jr., with Don's Gateway 2000 20 MHz 386 system.

Don and Dave both commented on the excellent service they received from Gateway. "Everyone is uniformly polite, friendly and helpful," Dave said.

At the Grand Canyon...

Papillon Grand Canyon Helicopters uses Gateway 2000 computers in its operation. Rick Carrick, chief pilot, started using PC's a few years ago to run point-of-sale software and to perform weight and balance calculations on aircraft, a critical safety and efficiency procedure. Initially he experimented with several computer firms. "I called Gateway because I liked their ads," Rick admitted. "But I've become a loyal customer because their machines are indestructible and they have excellent customer service."

Rick Carrick, Papillon Grand Canyon Helicopters, and his indestructible Gateway 2000 286.

Papillon Helicopters has another Gateway 2000 computer now – a 25 MHz 386 – and Rick said he's in the process of replacing all of the company's PC's with Gateway 2000 systems.

In Zurich...

Michael Paravicini runs a Gateway 2000 33 MHz 386 system. Michael is a management consultant for Price Waterhouse in Zurich. "I was impressed by Gateway's price-features comparison," he remembered. "My system cost far less than you'd expect to pay for a comparable computer." Continuing, he said, "It was also the responsiveness they showed when I sent a fax request for a quotation. Out of ten U. S. companies

Michael Paravicini, Price Waterhouse, and his Gateway 2000 33 MHz 386 system.

Choose Gateway 2000!

I contacted, Gateway was the most prompt and efficient in responding. I still haven't heard from some of the others."

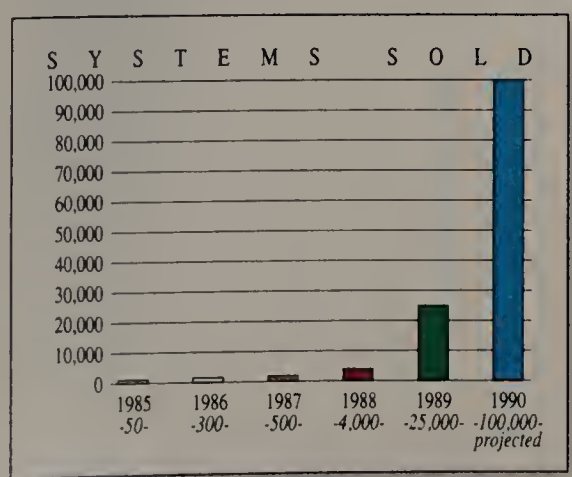
PC Magazine's survey about service and reliability confirms what these customers are saying:

"Gateway shared top billing with such heavyweights as Compaq, IBM, and HP for those who would buy their products again...Overall, Gateway's high marks bode well for the company's future, as does its commitment to customer service."

PC Magazine
September 25, 1990

From the Heartland

The combination of price, quality and service makes Gateway 2000 the best value in the industry. But value alone doesn't explain how a little company in the Midwest, just celebrating its fifth anniversary, managed to outdistance hundreds of other companies, selling more systems through the direct market channel than any other PC manufacturer in the country.



Gateway 2000 sells more computers through the direct market channel than any other PC manufacturer in the country.

"It was the cows," laughed Ted Waitt, Gateway 2000 President and CEO. "Of course." Computer magazine readers will remember the company's early ads featured a picture of the Waitt cattle farm with the headline, "Computers from Iowa?"

"We can't run that ad anymore," continued Ted, grinning, "because we built a new plant 14 miles down the road in South Dakota. But the cows really worked for us. They made the phones ring. From then on, though, we built our business on value – good prices on quality systems with old-fashioned, personal service."

Ted mentioned another reason for Gateway's success. "We take a long-term approach to customer service." he said. "When you buy a computer from Gateway 2000, you become part of our family and we're going to be there for you as long as you own that machine."

"In the computer industry, longevity should be measured in dog years."

As Ted talked about the company's fifth anniversary, he laughed again. "In the computer industry, longevity should be measured in dog years," he chuckled, "because everything's moving so fast. That makes Gateway 35 years old! But seriously, we've come a long way in five years. And I owe it all to the great people at Gateway and to our customers."

Gateway 2000 will be there for you 'til the cows come home.

When you add it all up, you'll understand why you've got a friend in the business at Gateway 2000.

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- 16 Bit VGA with 512K
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- 1 Parallel & 2 Serial Ports
- 101 Key Keyboard
- MS DOS 3.3 or 4.01
- MS WINDOWS 3.0

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FRED STIMSON

How to Avoid the PC Slump of 1991

Recession chills the heart of the most fearless PC vendors. Here are five simple ways they can keep you buying in the coming year.

Want to give your favorite PC vendor a good scare? Tell him you're going to put your buying plans on hold while you wait out the recession of 1991.

After getting hooked on years of hypergrowth, PC companies are noticeably fearful that a slumping economy may pull them down a notch or two. But not everyone's got reason to be afraid. Intel, Microsoft, and Compaq are among a few leaders showing record-breaking profits just at a time when others are beginning to feel the pinch.

What's their secret? Simple. Each of these companies played an indispensable role in defining the standard business-class computer most users want today: a 386 system with a classic AT-style bus and *Windows*. For those of us who ducked out of sight while the superpowers conducted their bus and operating-system wars, it comes as a sudden relief to know that at last it's safe to buy a PC again.

But you never know when industry agreement might veer wildly once more into turf wars and general chaos. So to keep things straight in the new year, here's a list of ways to keep the PC industry's motor humming even if the rest of the economy stalls. Of course, nobody's obligated to listen to my advice, but...don't say I didn't tell you.

1. Open Chips

Thanks to IBM's fateful decision to choose the 8088 processor as the soul of the original PC, Intel set the pace of innovation for three successive generations of PC technology—286, 386, and 486. Meanwhile, thanks to a wise cross-licensing agreement with Intel's rival chip maker AMD, PC clone manufacturers got cheap and plentiful 286 chips throughout the AT's heyday. As a result, Intel established the most potent standard ever in computer technology—over 40 million PCs strong.

Now, of course, Intel is embroiled in deep legal maneuvers to keep AMD from producing next-generation 386 and 486 chip technology, and clone makers, who can't seem to get their hands on enough 386s, are ripping mad about it all. Just think—if Intel had kept AMD from producing the 286 chip, we'd probably all be buying overpriced ATs today instead of cheap 386 powerhouses. Now, can someone explain how that would have been good for users or the industry? I can think of only two companies willing to try: Intel and—you guessed it—IBM.

Let's start out the new year right: Intel should drop its legal shadowboxing and get back to developing another generation of stunning technology. Meanwhile, let AMD fill the supply gap for bread-and-butter chips.

2. Open Buses

Now that Compaq has proved it can work with its competitors to develop the high-performance EISA bus without a major temper tantrum on anyone's part, IBM has finally taken some feeble steps to turn the Micro Channel architecture into a true industry standard. Too bad it isn't doing what the EISA group has done—set up an independent corporation to license the specification to any vendor who pays a nominal fee. In 1991, you can expect most mainstream PC manufacturers to sell EISA-based systems as standard fare. If IBM wants to keep the Micro Channel from becoming an endangered species, it needs to make a grand gesture to assure clone makers they won't get locked out the next time a chill, proprietary wind blows through Big Blue's halls.

3. Open Fonts

TrueType: PostScript's evil twin? Maybe so, judging from the nearly identical descriptions that Microsoft and Adobe pin on their respective creations. Microsoft got into the font and page-description–language business because it didn't want to pay big-time royalties to Adobe for a technology it needs to make *Windows* easy to use. Without a built-in font/graphic standard, displays look ugly, and simple printing can be a tedious and error-prone chore.

Action item: Hey, let's get together, guys! Adobe thinks it has the easiest standard to implement; Microsoft thinks it has the most powerful one. If

(continues)

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both technologies worked alike, then developers could choose the one they liked best, and users wouldn't have to worry about the problem at all.

4. Open Networks

Everybody knows that Novell has the lion's share of the LAN operating system market, but that doesn't mean it has the lion's share of the good ideas. In particular, Banyan Systems, with only about 5 percent of the network market, has established a number of important technical standards that make it easier for developers to create network applications. Without these standards, groupware would go the way of madras shirts and—dare I say it?—Micro Channel clones. Novell, Microsoft, and IBM should jump on the Banyan bandwagon right away.

5. Open Windows

Even as it proclaims *Windows* an industrywide standard, Microsoft is busily finding ways to make its application programs "special." Take BASIC, for instance. This innocuous little language is finding its way into every *Microsoft Windows* application, so where's the specification that allows other software developers to take advantage of it too? One of these days we're likely to find that BASIC has become the "standard" macro language for *Windows*. Who gets hurt if you can find "macro BASIC" only in Microsoft programs?

Of all the companies that have benefited from the open standard set by the IBM PC and DOS, Microsoft arguably has done so the most. That's fair—arguably, it has contributed the most. And it stands to gain—or lose—the most from the next turn of the economic cycle. Let's hope it spins the wheel vigorously in the direction of open systems.

As always, I'm interested in your opinions on this or any other subject. Write to me at *PC World*, 501 Second St. #600, San Francisco, CA 94107; fax 415/442-1891; MCI Mail Richard Landry/301-3685.

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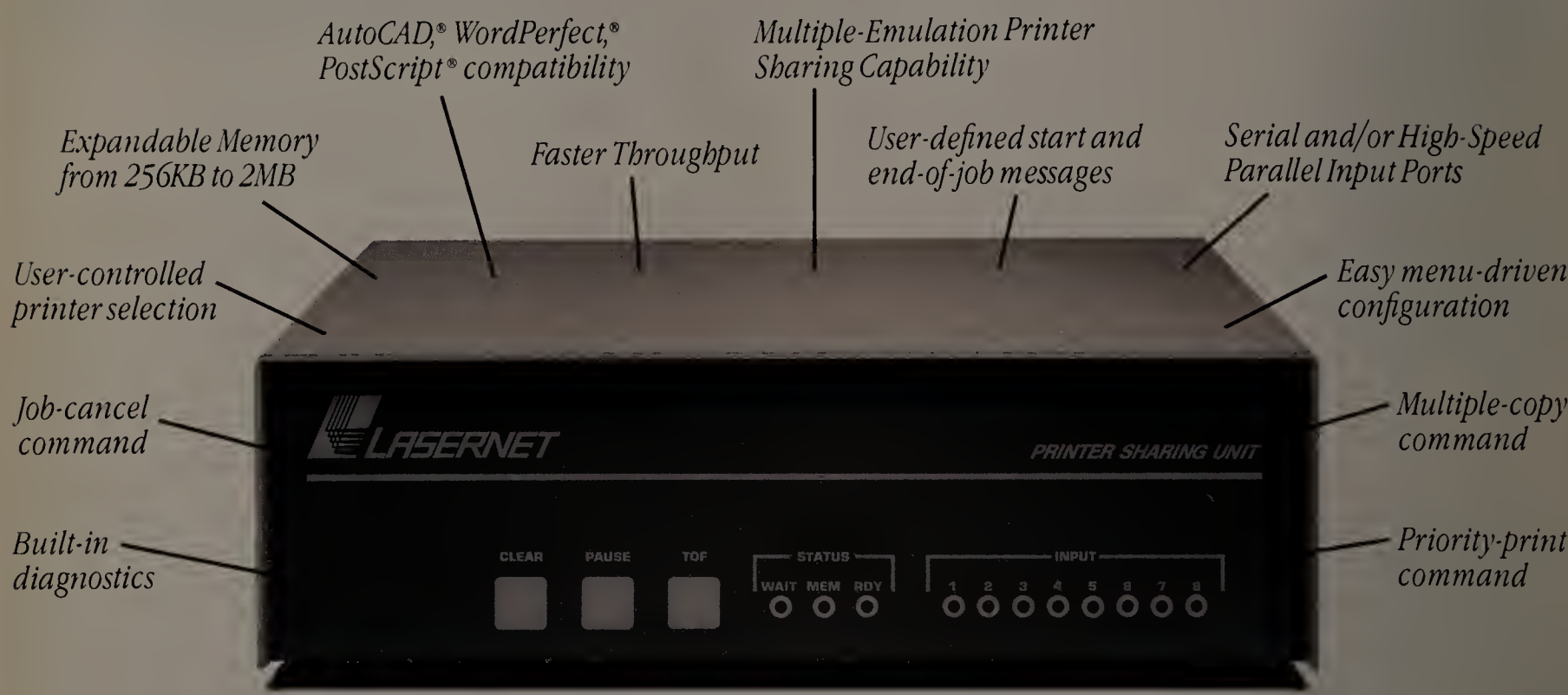

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LETTERS

Reactions and responses from the PC World community

TIM CARROLL

Risky Business Revisited

After reading Richard Landry's column "Risky Business" in September, I have to say that I'm fed up with "look-and-feel" lawsuits. I agree with Borland's Philippe Kahn that Lotus should stick to developing software and stop suing competitors. *Quattro Pro* sales do affect Lotus directly. But the real test of a product is performance—not the look and feel of its menus. A common menu/command structure allows users to take advantage of their options without having to learn a different interface every time they find a new product that better serves their needs.

Harwood W. Loomis
Woodbridge, Connecticut

As a registered user of both *1-2-3 2.2* and *Quattro Pro,* I've found *Quattro Pro* to be better. This lawsuit against Borland makes Lotus look like a big bully who is mad at a smaller company for coming up with a better product! In protest, I have removed *1-2-3* from my hard disk, and I bought some Borland shares with the money I *was* going to spend on the new version of *Agenda.*

Ralph H. Hannon
Malta, Illinois

I enjoyed reading your speculation about the Lotus-Borland suit and the calculated risk that Philippe Kahn took in adding a Lotus-like interface to his excellent spreadsheet. But consider the risk that Lotus is taking by inviting comparison of *1-2-3* to *Quattro Pro,* a superior product. Lotus's interface is no more copyrightable than iambic pentameter.

Martin Condon
Scotia, New York

"Risky Business" was interesting commentary. You didn't mention that Lotus built the *1-2-3* interface as a clone of *VisiCalc.* In fact, I picked *1-2-3 1A* precisely because the interface required no new learning.

Evans M. Harrell
Marietta, Georgia

The Price of Good Grammar

Your comments about grammar checkers in the August *Industry Outlook* ["Managers Turn to Grammar, Style Checkers"] hit the nail right on my thumb. These products may have strong sales, but I'm a disenchanted buyer who agrees with professional writers who scorn them. I've found that all three of the top programs still miss blatant errors. Clear, effective writing requires two faculties that algorithms can't yet provide: good taste and sound judgment. At the moment, the price of using grammar checkers is eternal vigilance.

Gilbert Leight
Plano, Texas

Satisfaction Guaranteed

Regarding reader John H. McKinney's letter "Who's Defending the User?" in September, this shareware developer does provide users with a money-back guarantee. The software development community would do well to embrace this spirit of hassle-free returns. Loyal customers will be our reward.

Rich Levin
President
Levin & Associates
Philadelphia, Pennsylvania

Previews Make a Good Impression

I think most people write only when they want to kick about something you've written. Well, here's a pat on the back for your coverage of news and new products. I particularly appreciated your September preview of *1-2-3 3.1* ["1-2-3 Meets Windows Halfway"]. In the realm of PCs, things change so quickly that it's next to impossible to keep current. I find myself so busy that I have to restrict my reading time, and your previews give me detailed looks at important new products. They're always a must-read for me.

Will Sampson
Miami, Florida

Looking for the Right Stuff

I'm glad I read "Do Presentation Manager Spreadsheets Have the Right

(continues)

ANTHONY RUSSO

Stuff?" in September. I've been following PM developments right along while putting *Excel for Windows* to good use. I'm ready to switch operating systems when the switch makes sense—but your excellent article makes it clear that the time hasn't come.

Cynthia Barton
Helena, Montana

Unlimited Laser Review

After reading "Fonts Unlimited: Seven Smart Lasers for Under $3000" in September, I have to applaud your courage. I expected you to automatically grant a Best Buy to the Hewlett-Packard LaserJet III. After all, didn't HP write the book on scalable font technology? Instead, you honored the Texas Instruments MicroLaser PS17. Why? Because it's the *real* Best Buy in its class. Thanks for not limiting your accolades to the most popular products. And keep on giving us the straight story!

Andrew Denton
Wilmington, Delaware

I feel your assigning a Best Buy to the Texas Instruments MicroLaser PS17 may do disservice to the other models that were featured, especially the LaserJet III. A laser printer's value derives from its ability to produce a superior printed image. Any reader looking at the type comparisons in your article would rate the LaserJet III, despite a number of secondary deficiencies, the best product to buy.

Joseph Zmuda
San Francisco, California

Project Management in the Real World

Thanks for "Project Management Reaches the Real World" in September. I've been hungry for a realistic assessment of project management software. Mark Burgess provides a good balance of digestible information.

Anthony Carerra
New York, New York

I wish I had read "Ten Tips for Project Sanity" six years ago. If you manage projects, it should be required reading. Otherwise, you may have to learn all these things in the school of hard knocks!

Roland Edburg
Minneapolis, Minnesota

As a longtime subscriber, I know that people often find it easier to complain than compliment. But as an experienced master scheduler, I must dispute the Best Buy choice in your project management review. *SuperProject Expert*'s RAM requirements are low enough to allow it to run on an XT. Unlike Best Buy *Microsoft Project for Windows*, it also provides PERT analysis (the one

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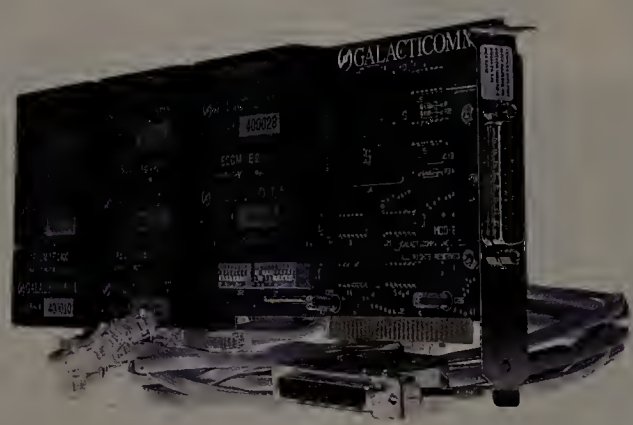

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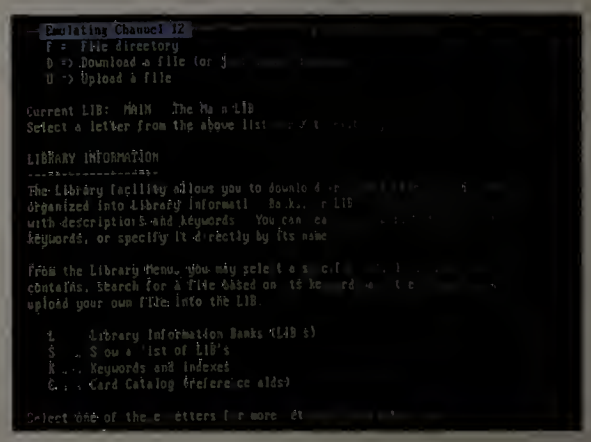
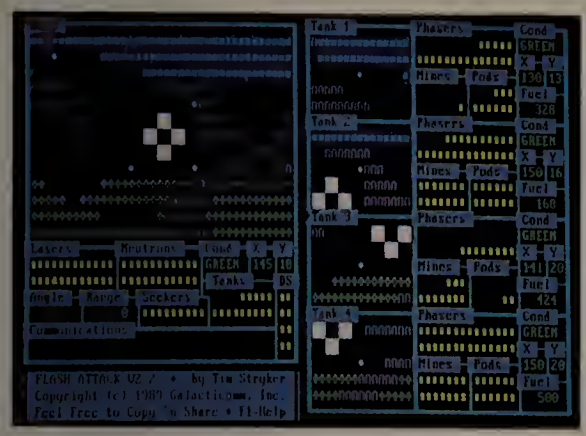


If you decide to offer *online games and amusements:*

The Entertainment Edition of The Major BBS has everything that the starter system does, plus Quest for Magic (a multi-player interactive text adventure game), Androids! (a multi-player arcade-style ANSI-graphics game), Flash Attack (a futuristic tank and laser battle for multiple players with IBM PC's), and the Action Teleconference Link-Up, which includes private "chambers", action verbs (grin, wink, nudge, etc.), the ability to link to other systems for huge multi-system teleconferences, custom entry/exit strings, user-configurable profiles, and much more. This Edition supports the Flash™ Protocol (where most of the game functionality is on the user's

end of the phone line), for which dozens of incredible new multi-user games are now being developed. Upgrading from the starter system to the Entertainment Edition is quick



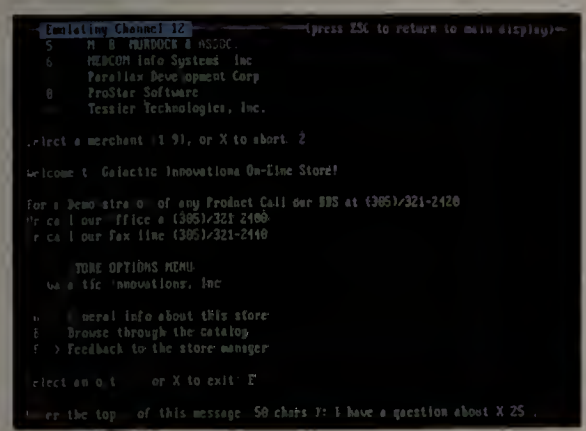
and easy and involves no loss of data or function. Prerequisite: The Major BBS Standard Edition.

Entertainment extensions ..... $ 149
*Entertainment C source extensions** .. $ 129

If your requirements include *order entry and catalog sales:*

The Shopping Mall Edition of The Major BBS has everything that the starter system does, plus online shopping. Your online mall can have multiple "stores", each run by its own separate "merchant", if desired. Each merchant has control over his or her own product line, pricing, discount structure, store welcome message, sales tax handling, etc. Also, each merchant may create up to 6 different payment methods (e.g. VISA, MC, AMEX, C.O.D., "bill me", etc.), and up to 6 different shipping methods (e.g. UPS, FedEx, US Mail, etc.), each with its own rates (flat rate, percent of sale, 1st-ounce/add'l-ounce, or 1st-pound/add'l-pound). Users may browse product catalogs at no obligation, or order products and services directly online! Orders generate invoices that are posted to the individual merchant as attachments to E-Mail. To upgrade from the starter system to the Shopping Mall Edition takes only a few minutes. Prerequisite: The Major BBS Standard Edition.

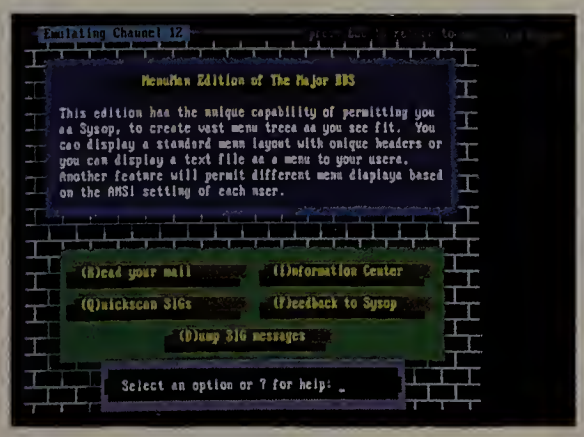
Shopping Mall extensions ..... $ 249
*Shopping Mall C source extensions**. . $ 189



For super-flexibility of *menu trees and ANSI screens:*

The MenuMan Edition of The Major BBS can do everything that the starter system does, and in addition you as Sysop can create your own menu trees, with menus leading to menus leading to menus, as deeply "nested" as you like. The "leaves" of your menu trees can be ordinary ASCII or ANSI files, which are simply dumped to the user's display (with or without automatic screen breaks), or they can be any of the built-in functions of the BBS such as scanning the user's incoming E-Mail or firing up a SIG quickscan. Includes commands like *GO <pagename>*, *FIND <topic>*, *USERS*, and for the Sysop, the equivalent of the DOS commands *DIR*, *RENAME*, *COPY*, *DEL*, *MKDIR*, and *RMDIR*, as well as a set of privileged commands for editing and extending the menu trees, remotely, while the BBS remains fully online. Upgrading from the starter system to the MenuMan Edition takes only minutes. Prerequisite: The Major BBS Standard Edition.

MenuMan extensions ..... $ 149
*MenuMan C source extensions** .... $ 129



As your system grows larger...

The GalactiBox™ is our 16-slot "expansion chassis", for large-scale systems. It has the unique ability to address individual modems by slot number rather than just COM port address, so you can use up to 16 standard internal modems in it, side by side, without conflict. Includes built-in 150W power supply, interface card for your XT/AT/386/486, cables, and full documentation. Up to 4 boxes may be attached to one CPU, for a total of up to 64-channel expansion capacity. Prices shown below are for standard 300/1200/2400 bps Hayes-compatible internal modems. We also have 9600 bps V.32/V.42 MNP Class 5 modems available, call for prices.

GalactiBox (unpopulated) ..... $ 1992
GalactiBox w/4 modems ..... $ 2416
GalactiBox w/8 modems ..... $ 2840
GalactiBox w/16 modems ..... $ 3688

...and that's not all! For advanced applications, we also offer an X.25 direct-connect software option, a protected-mode development toolkit, and special licensing arrangements for up to 256 simultaneous users! And don't forget the smorgasbord of 3rd-party add-ons available, such as The Major Database from Galactic Innovations. Custom programming and integration services are also available. Your system can grow in power and sophistication, far into the future, with The Major BBS.

Here's How To Order:

Just dial (305) 583-5990 and say, "I'd like to place an order!" We can generally ship your order within 48 hours. We accept major credit cards, or we can ship C.O.D. Prices shown do not include shipping or insurance.

For more information, you may either call the main order number and ask for a sales engineer, or dial (305) 583-7808 with your modem (8-N-1) for a free demo of most of our products. This demo system also contains an online Shopping Mall with many of the 3rd-party add-ons available for The Major BBS, operated by the 3rd-party vendors themselves.

Give us a call today!

The Major BBS, Flash Protocol, and GalactiBox are trademarks of Galacticomm, Inc. PC, PS/2, XT, AT, and PC-DOS are trademarks of International Business Machines Corp. Hayes is a trademark of Hayes Microcomputer Products, Inc. The Major Database is a trademark of Galactic Innovations, Inc. Turbo C and Turbo C++ are trademarks of Borland International, Inc. MS-DOS and Microsoft C are trademarks of Microsoft Corp. UPS is a trademark of United Parcel Service. FedEx is a trademark of Federal Express Corp. MNP is a trademark of Microcom, Inc.

**The C source code extensions are necessary, if you wish to combine multiple extended Editions together, or add 3rd-party software, or develop your own modifications. Prerequisites, in each case, are the Standard Edition C source code, and the corresponding extended Edition.*

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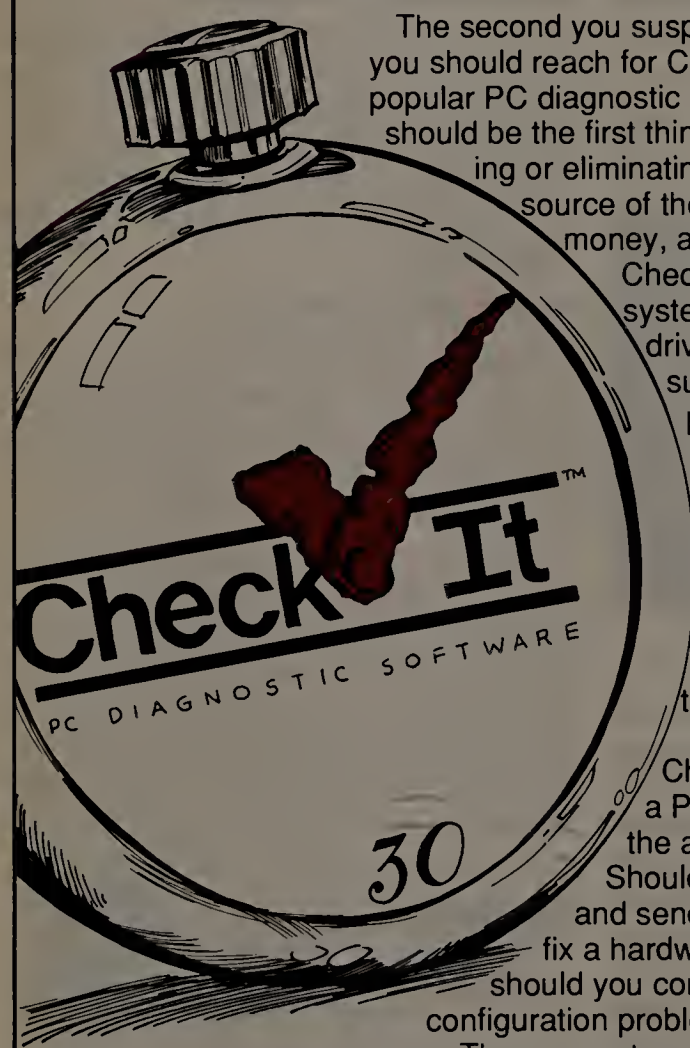

The second you suspect a problem with your PC, you should reach for Check✔It, the world's most popular PC diagnostic software. Running Check✔It should be the first thing you do -- because confirming or eliminating your PC's hardware as the source of the problem can save you time, money, and unnecessary repair calls. Check✔It will test your PC's main system board, memory, hard disk drive and floppy disk drives, video subsystem, communication ports, printer, keyboard, mouse, or joystick. Check✔It will also display key software and setup data, including your PC's exact equipment configuration, current IRQ assignments, memory allocation, device drivers, and CMOS table.

Take a minute to run Check✔It the next time you have a PC problem. Then you'll know the answer to these key questions: Should you back it up, pack it up, and send it out for repair? Should you fix a hardware problem yourself? Or, should you concentrate on the software and configuration problems that you can correct?

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chart that shows things the way they are). I think *SuperProject Expert* from Computer Associates is the real best buy of the group.

Steven Jay Moshlak
Tarzana, California

Looking for an Amiga

It seems to me you're leaving out an important member of the home computer industry. Commodore has a reputation for producing game machines, but the Amiga runs all the major business applications. Mainly, I want the reason you ignore Commodore.

Michael McKnight
Lewisville, North Carolina

We reviewed the Commodore PC40-III last December in "12-MHz ATs: Home-Office Alternatives." Amiga fans can check out IDG's AmigaWorld, *80 Elm St., Peterborough, NH 03458; 800/343-0728. —Ed.*

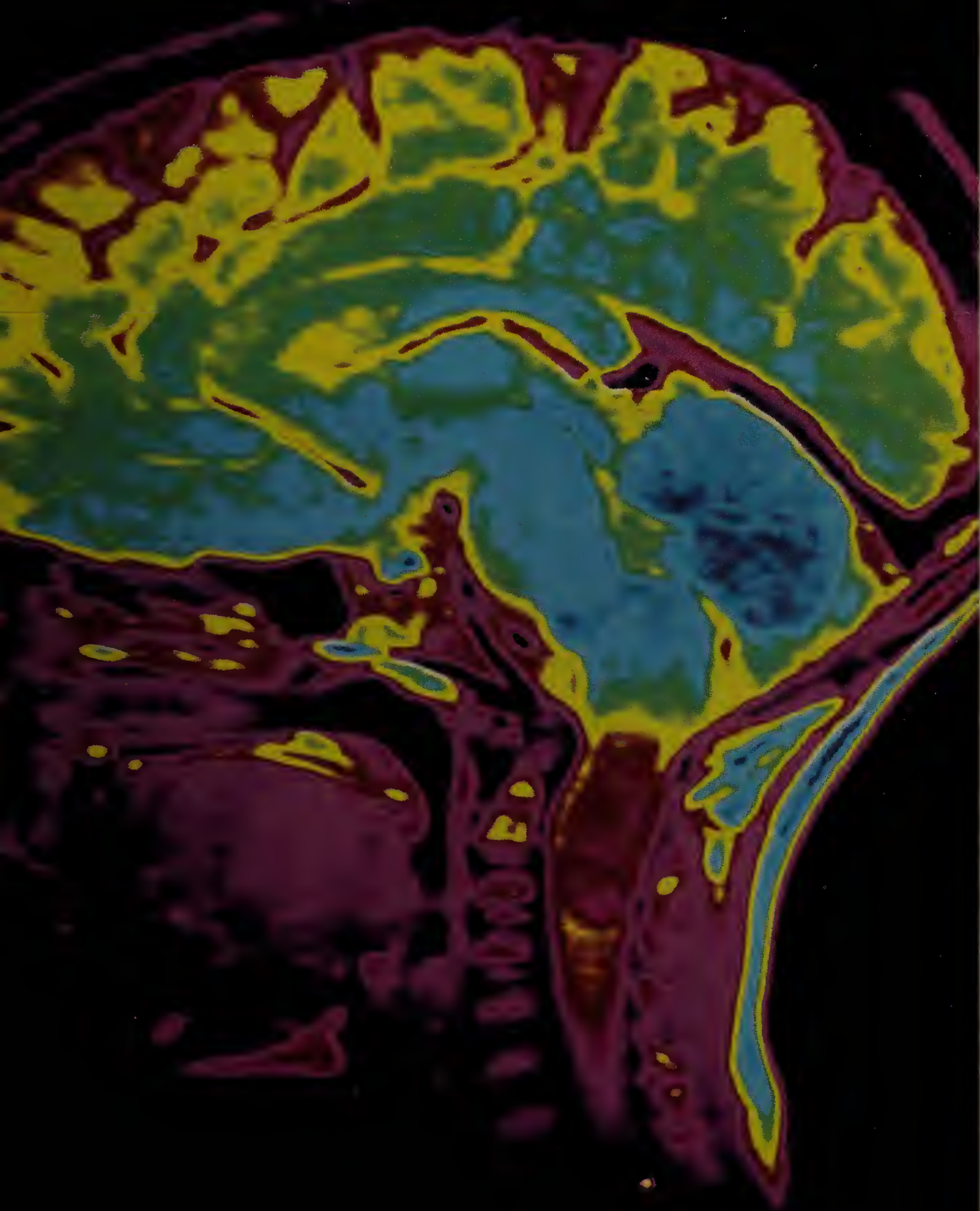
Users Unite!

Too bad your August listing of user groups in *Consumer Watch* didn't mention our organization. The Association of Personal Computer User Groups (APCUG) is an all-volunteer, not-for-profit international organization that serves as an information network for over 140 user groups in the United States and around the world. The yearly membership fee for each user group is a modest $25, and APCUG provides each member group with a no-cost Tymnet account for the use of its president and newsletter editor. With the account comes free worldwide access to our bulletin board service. Information on APCUG and its many services is publicly available on our BBS at 408/439-9367. You can either download a user group registration form from the BBS or write to APCUG, 1101 Connecticut Ave. NW #901, Washington, DC 20036.

Roland Cole
President
APCUG
Washington, D.C.

(continues)

At Mount Sinai Hospital, some of the best brains in the country rely on Sony.



Fortunately, critical patient data is tucked into the safest place of all. A Sony data cartridge.

In fact, hundreds of detailed files can be accessed from one, single, solitary data cartridge.

Which is how the renowned doctors at Mount Sinai Hospital in New York City store patient diagnostic data.

Not one byte can be lost.

That's why Sony produces, with exacting care, a range of mini and ultra-high capacity data cartridges up to 525 megabytes.

And if Sony data cartridges can do all of this, they can also back up another vitally important life force with the utmost integrity.

Your business operations.

SONY

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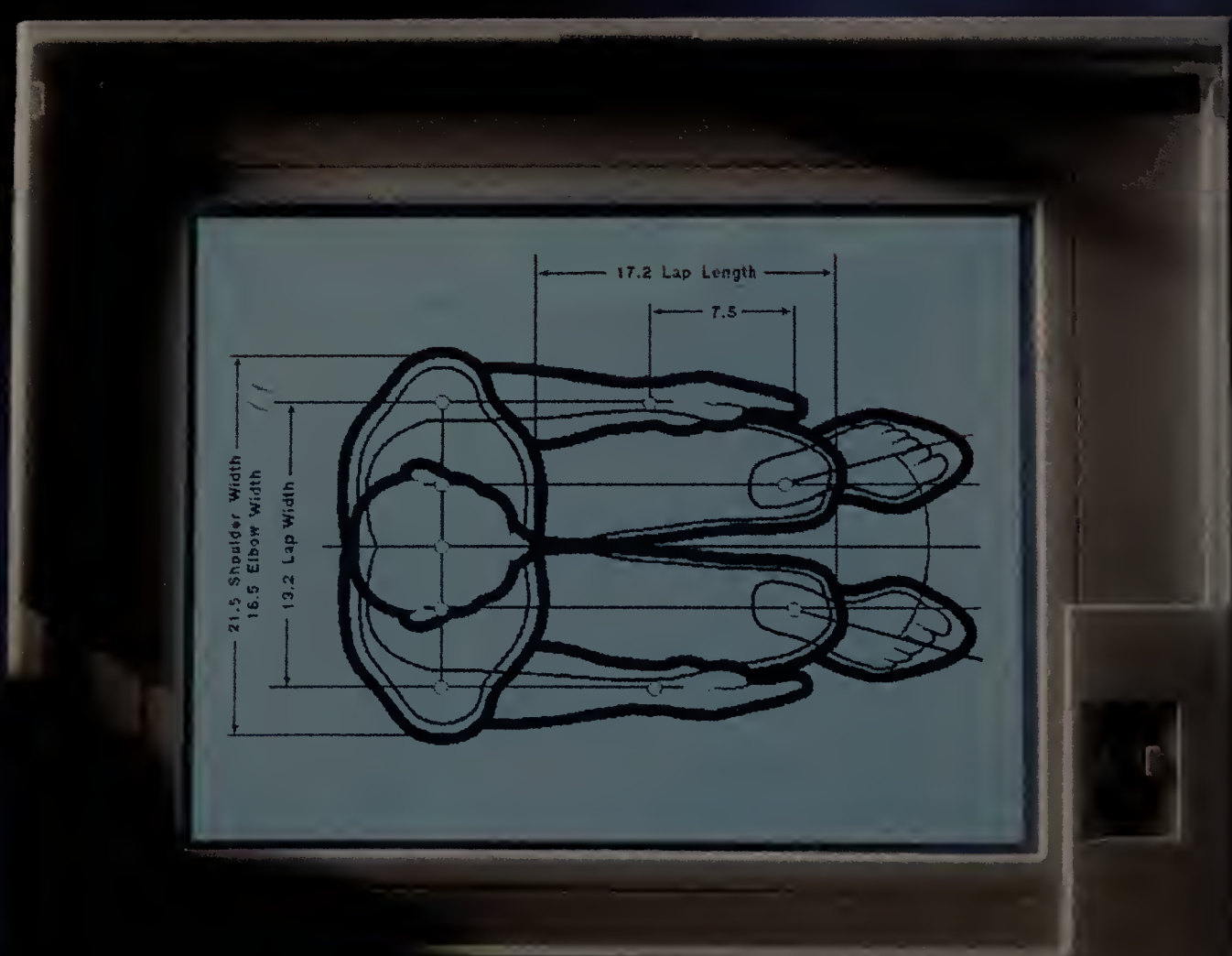
A laptop designed that while your your lap will stay



*Third party drive port available from Manzana Microsystems, Inc. Epson is a registered trademark of Seiko Epson Corporation.

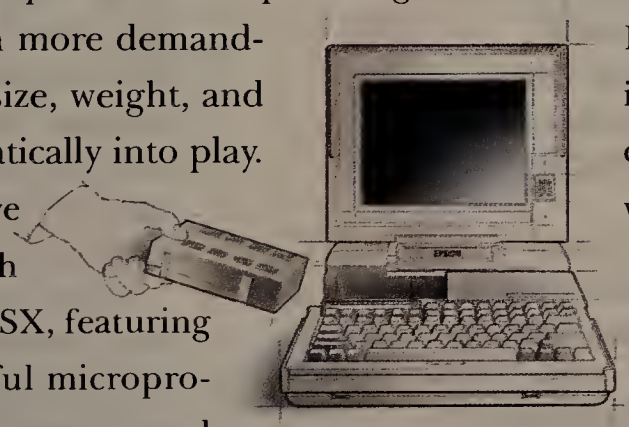
with the knowledge needs may expand, etty much the same.

Introducing the Equity LT 386SX Laptop

Adding power, speed and peripherals to a personal computer is a constant test of design innovation.

Configuring a *laptop* to meet expanding needs becomes an even more demanding challenge because size, weight, and battery life come dramatically into play.

Epson® engineers have met that challenge with their new Equity LT 386SX, featuring one of the most powerful microprocessors available in a battery-powered laptop. It is a design of both distinctiveness and common sense.



Epson's unique, removable hard drive: key component of the most flexible laptop ever made.

Epson's Datasafe hard drive can be removed, making it easy to transport, or store separately for added security. With an optional* drive port, the hard drive can plug directly into a desktop computer. It offers a choice of 20 MB or 40 MB capacity, and a shock indicator that alerts the user to the occasional hard knock.

The modular design of Epson's entire laptop series suggests a new standard for customized performance. The user can easily install or remove options such as a modem, extended RAM, external keyboard, or 2/3 length industry standard card. The VGA screen can also be removed or left in place when using an external monitor.

The Epson laptop indicates its own vital signs—battery life, speed, and disk drive in use—on a unique LCD status bar, and even has the good sense to turn off its own screen and hard drive when not in use.

The LT 386SX offers a degree of speed, power and flexibility once limited to desktop computers. In fact, there is one feature of this remarkably engineered bit of technology that a desktop can only envy. Its size.

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The critics love it!

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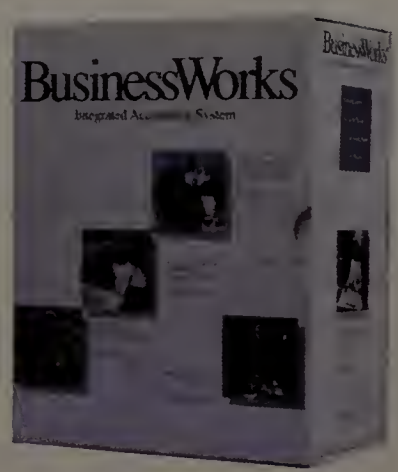
#1 Overall 1988
-Software Digest



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Manzanita
SOFTWARE SYSTEMS

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Marketing Moxie

I was very pleased to read in the August "14 SX Systems: Big Deals in Small Boxes" that you consider the Wang PC 350/16S "well suited for serious business computing." But the PC 350/16S is not "Wang's first new PC in nearly a decade." In fact, Wang brought out its first PC in 1982 and has introduced over a half-dozen lines of PCs in the last eight years, including a recent Micro Channel system. Since your review, we've announced the addition of a 200MB IDE hard disk. And contrary to what you've stated in the review, Wang dealers commonly give hardware discounts as well as bundling PCs with applications and services to be competitive. I believe the PC 350/16S represents a better value than the review gives it credit for on the basis of its list price.

John C. Smith
Director
Wang Microsystems
Lowell, Massachusetts

Corrections and Clarifications

In an August *Product Outlook* item about *Pacioli 2000*, we gave an incorrect phone number for M-USA Business Systems. The correct number is 800/345-4243. Also, the number of accounts that *Pacioli 2000* supports is limited only by available disk space.

September's *Star-Dot-Star* item entitled "Call Me Irresponsible, But Call Me Anyway," which dealt with calling subroutines from within batch files, contains an error. The first sentence in the second paragraph on page 250 should read as follows: "If %1 does not equal 'proc', execution continues at the command echo main %1." *PC World* regrets the errors.

Send your reactions, responses, and ideas to Letters, PC World, *501 Second St. #600, San Francisco, CA 94107; CompuServe 74055,412; MCI MAIL PC World Editorial; or 415/442-1891 (fax). Include your name and the name of your city and state. We reserve the right to edit letters.* ●

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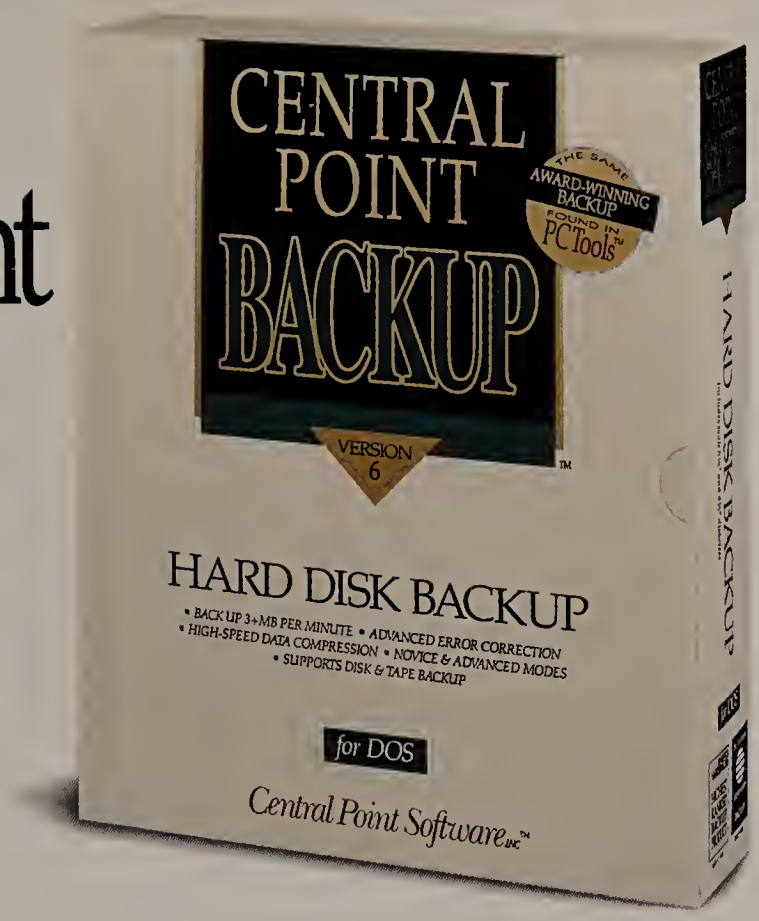

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Offer ends December 31, 1990.

☐ Enclosed is $35 (U.S.) for Central Point Backup. Also enclosed is page 1 from my Fastback Plus manual, or my original diskettes.

30-Day Money-Back Guarantee: If, after 30 days, you're not satisfied with this product for any reason, return the complete package for a full refund. ☐ Check enclosed ☐ Visa ☐ MasterCard

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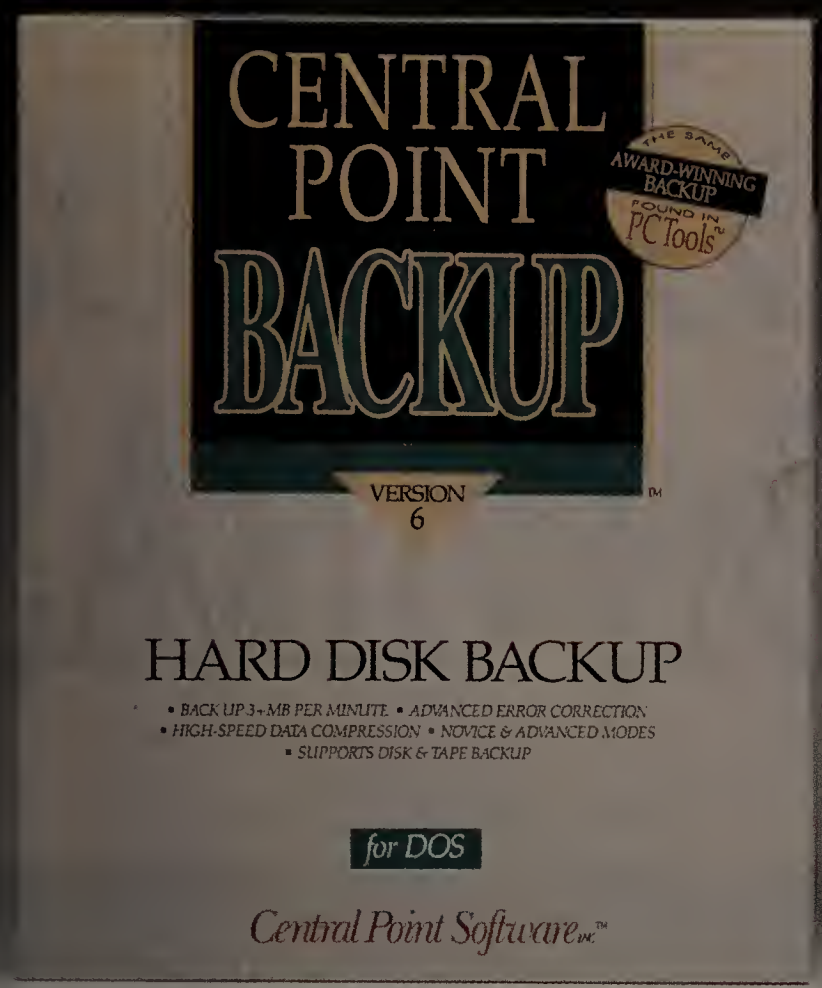

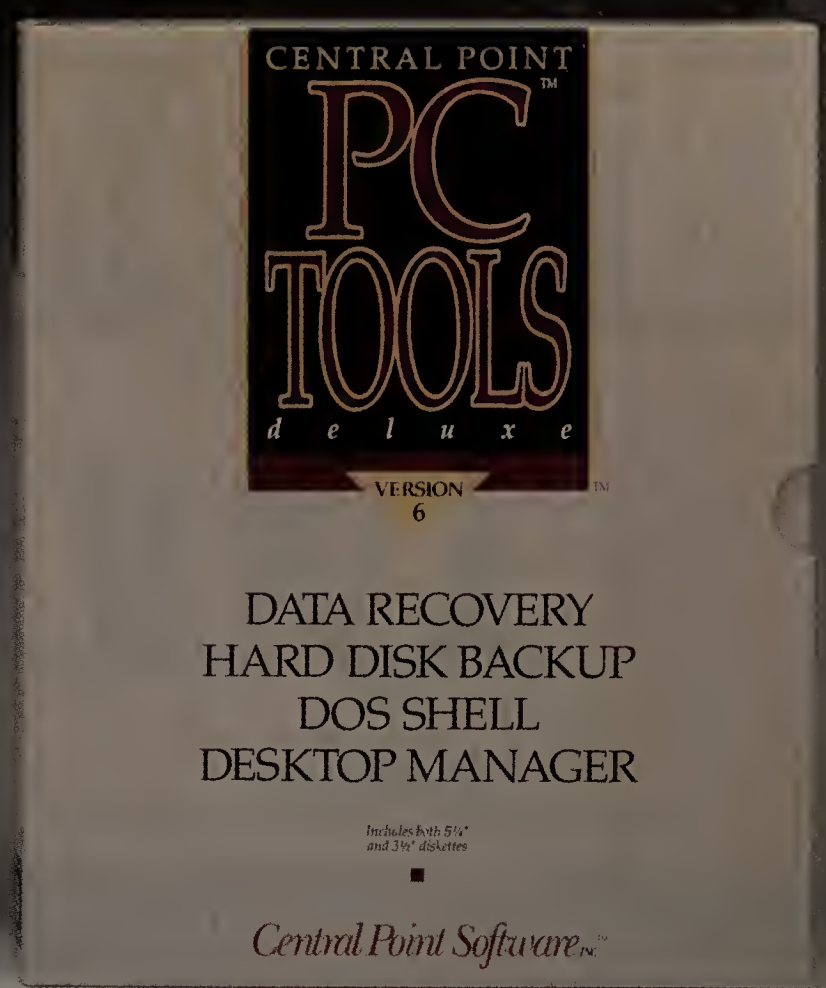

Introducing a new backup program that's already the leader.

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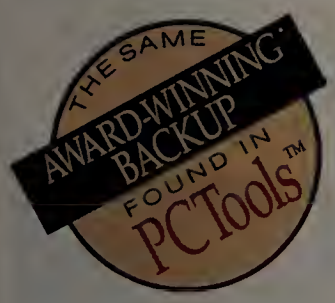

InfoWorld *and* PC World *have both selected Central Point Backup as their top pick for backup.*

Buy PC Tools and get Central Point Backup, plus all our other award-winning utilities. Or, if all you want is backup, get new Central Point Backup.

Either way, you get the fastest backup software available. As well as the only mainstream backup product that supports tape drives.

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Mouse support, pull-down menus and context-sensitive help make it a snap to learn and use. Other labor-savers include a built-in SCHEDULER for unattended backups. And a COMPRESS option that reduces disk or tape usage by up to 60%.

BACKUP TIME

	InfoWorld	NSTL
Central Point Backup	7:00	2:03
Fastback	9:17	2:43

InfoWorld tests on an Intelligent Data Systems PC-286 AT; National Software Testing Laboratories used a Compaq Deskpro 286s.

Central Point Backup is the only backup program you need to know. It backs up on all these different formats.

Pick up Central Point Backup for just $99. Or, get PC Tools for $149.

Either way, you end up with the backup program that's already the leader.

Special trade-in offer: Get Central Point Backup for just $35. See details on attached coupon or call 1-800-445-4346.

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BOB DAVIES
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SCOTT ROBERTSON
President, Champion Business Systems, Golden, CO:

"We think that it's solid. We think it's reliable. We think it's an excellent foundation for future development. The great thing about dBASE IV is that it has a flexible language and a good user interface. With dBASE IV version 1.1, end-users can take the product and tailor it so it fits their exact needs."

After running their own extensive tests, these independent experts have come to some very favorable conclusions on dBASE IV® version 1.1. We think you will, too.

. dBASE, dBASE III PLUS, dBASE IV Ashton-Tate and the Ashton-Tate logo are registered trademarks of Ashton-Tate Corporation. Other company or product names mentioned may be trademarks of their respective companies.

se Experts Speak
E IV Version 1.1.

TONY LIMA
Author of "Inside dBASE IV," President, Pacific Systems Design Workshop Inc., San Carlos, CA:

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RICHARD BRENNER
President, Westar Systems, Colorado Springs, CO:

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SAM GILL
President, DataWiz International, Foster City, CA:

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"Before he got Translate, Dan Gallegos spent thousands every year on professional translators who took days to do a single report. This year, Gallegos spent less than $500 once, on Translate. It takes about a minute per page plus minor editing, Gallegos may never spend another dime on translation."
—Dan Gutman, Success Magazine

Translate 1.1 is an enormously useful tool for anyone who has to communicate in writing with America's fast-growing Spanish-speaking population.

With this revolutionary software program, you simply input your English text. Seconds later, you get a precise unadorned Spanish translation. Nuances of language, stylistic preferences, corporate jargon, and specific terminology can be easily implemented through the dictionary update function.

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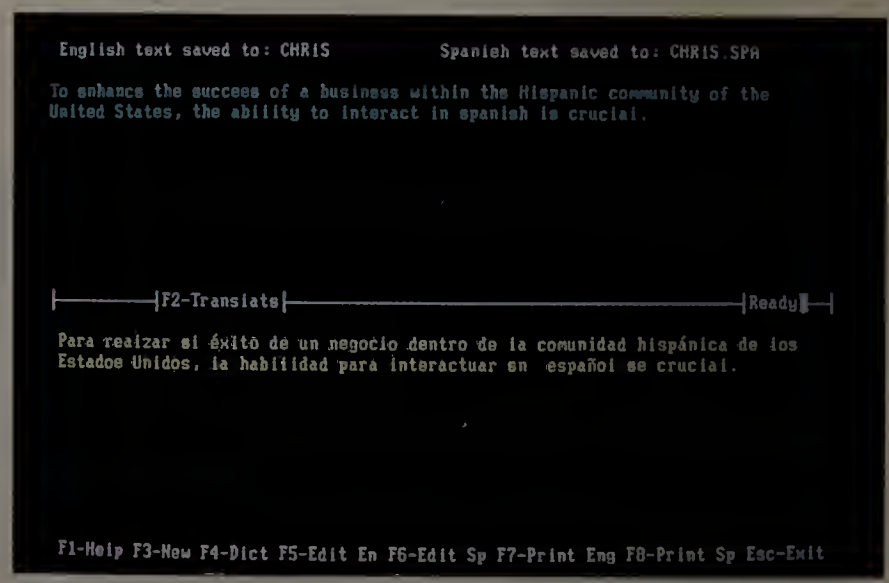
—Winston Roberts, PCM Magazine



Translate

Breaking the language barrier.

A product of FINALSoft

System requirements: IBM®XT®/AT®, PS/2 or compatible (8Mhz. or higher recommended), DOS 3.0 or higher, hard disk, and 512K RAM. © Copyright 1990 Finalsoft Corporation. All rights reserved. Finalsoft is a registered trademark of Finalsoft Corporation. IBM, XT/AT and PS/2 are registered trademarks of International Business Machine Corporation.

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THE HELP SCREEN

PC World offers answers and advice at every level

Make your laptop's cursor visible with WordPerfect, protect your root directory files, prevent parity check errors, find fonts for the DeskJet, learn how to free up workstation memory, and more.

Karl Koessel

Laptop Cursor

Q. *I find that the cursor on my new Compaq LTE/286 is nearly invisible when I use* WordPerfect 5.0. *Is there a patch (or some alternative) that will convert the cursor to a blinking box that can be seen more readily and thus make the program more usable?*

Roy W. Menninger
Topeka, Kansas

A. You can easily change the cursor's size for DOS and all applications, like *WordPerfect*, that use DOS's cursor. Install the *WordPerfect* utility programs (if you haven't already), and at the DOS prompt, change to the *WordPerfect* directory and enter the command **cursor.** Use the cursor keys to change the cursor's size. When you like what you see, jot down the command highlighted at the bottom of the screen ('CURSOR/BG', for example). Press **<Enter>** to return to the DOS prompt with your new cursor, and run *WordPerfect*. The cursor will remain its new size until you shut down the system or a program changes it.

To automate changing the cursor's size, place the selected highlighted command in your AUTOEXEC.BAT file after the PATH command (which must list the *WordPerfect* directory), or make a batch file that runs that command just before running *WordPerfect*.

Running *WordPerfect* in monochrome mode may also improve the legibility of the cursor; give it a try by using **wp /mono** to start the program.

A Read-Only Root

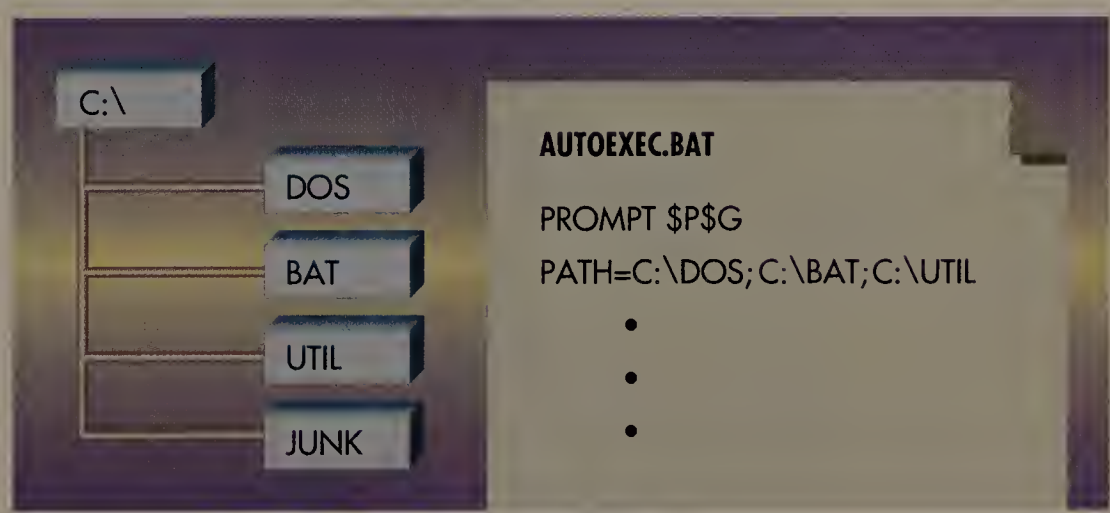
Q. *Several times I have turned on a computer only to receive the message 'Bad or missing Command Interpreter'. Further investigation revealed that all the files in the root directory of drive C: had been erased. I had to boot from a floppy disk, copy COMMAND.COM from the floppy disk to the hard drive, and restore or recreate my other root directory files. Any thoughts on what causes this or how to avoid it?*

Stephen Lang
Boise, Idaho

A. You can lose or corrupt files in many ways. That's why you have to back them up regularly. However, you can give files that don't change—particularly those

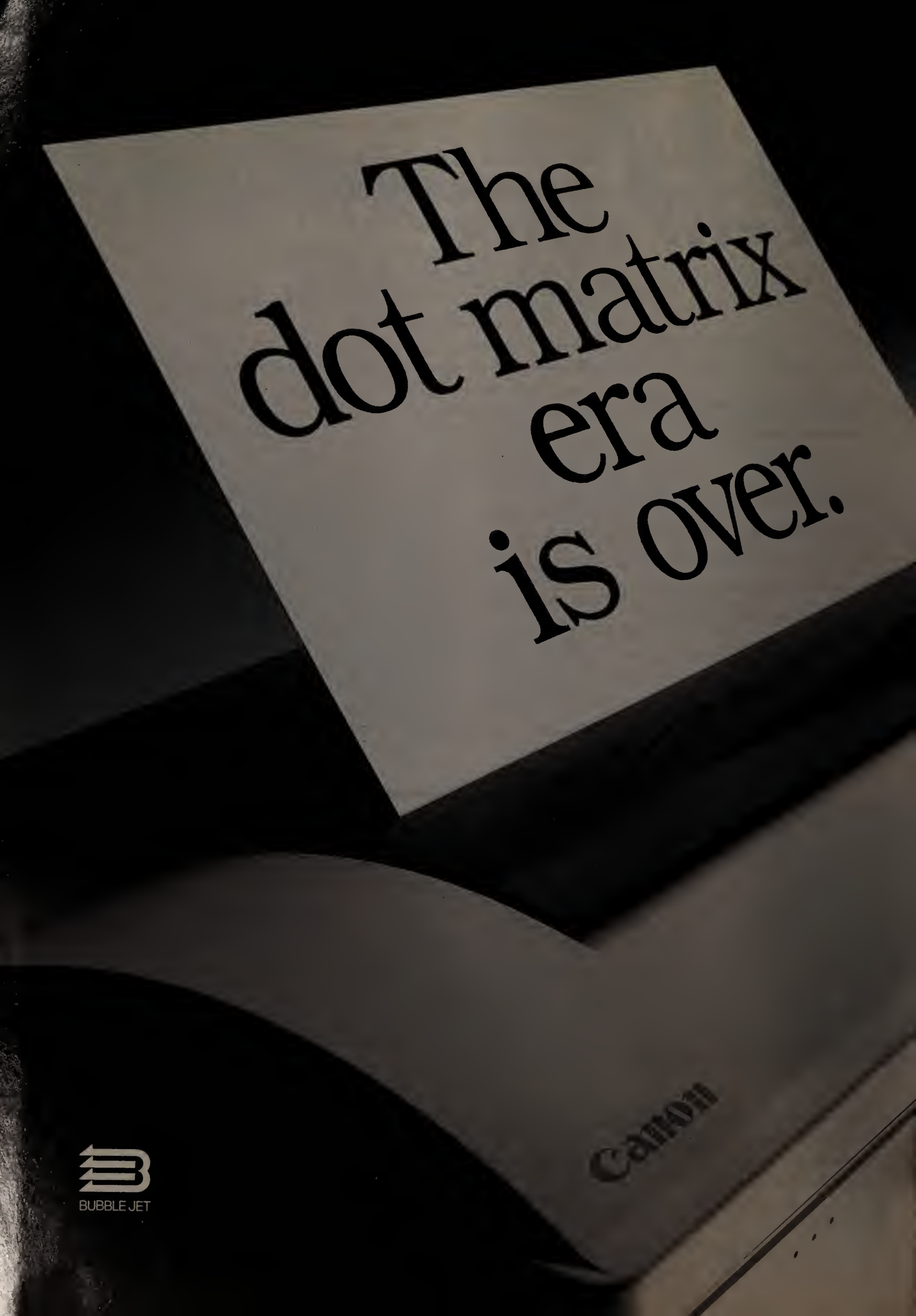
(continues)

Structural Advantage



With a little directory organization and an appropriate PATH, hard disk users can easily access DOS commands, batch files, and other commonly used utilities. First create three separate directories—DOS, BAT, and UTIL. Next copy all the utilities (like FORMAT and CHKDSK) from your DOS disks into the DOS directory, put all of your batch files in the BAT directory, and keep your favorite utilities (such as PC Tools) in UTIL. Then make sure your AUTOEXEC.BAT file's PATH command references those directories. You'll be able to run any of those commands, batch files, or utilities from the DOS prompt, regardless of which drive or directory your system is currently logged on to. You can also help keep your directories free of clutter by creating a JUNK directory—a holding tank for files you haven't classified yet.

ANTHONY RUSSO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in the root directory—some protection by making them read only. Use the DOS command **attrib +r** *drive:\path\filename .ext* (*drive*: and *\path* are optional, and wild-card characters within *filename* and *ext* are recognized). For example, to make all drive C:'s root directory files read only, type the command **attrib +r c:*.*** at the DOS prompt. (To remove the read-only attribute, use the same command, but with **-r** instead of *+r*.)

Note that ATTRIB.EXE is an external DOS command; you should keep a copy of it and of all the files on your DOS disks in a single directory (C:\DOS is an appropriate name) and use the command **attrib +r \dos*.*** to make them all read only.

You can further protect files by keeping program and data files in their own directories—never in the root—and by having AUTOEXEC.BAT automatically log you into a "scrap" directory (\JUNK, for example) when you turn on your PC. Hard disk files will be even safer if you partition the hard disk into two logical drives and keep programs on one (C:) and data files and your "scrap" directory on the other (D:).

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Parity Check

Q. *On several occasions, such as when I'm changing from one menu to another within some program, my system has crashed. The screen goes blank, the message 'PARITY CHECK 2' appears, the system freezes, and I lose whatever work I haven't saved. What does this message mean?*

Miguel B. Quintos
Alexandria, Virginia

A. IBM personal computers and many compatible systems include a ninth bit for each byte of memory. Software *(continues)*

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Robert Lauriston
Contributing Editor

To understand the basic principle behind Fastback Plus, tear out this page and destroy it.

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your hard disk will eventually come crashing down. Manufacturers expect it. They even give hard disks an "MTBF" rating – the Mean Time Between Failures.

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doesn't use this bit; the system sets it on or off depending on the value of the other eight bits in order to monitor unintended changes in memory. If one of the bits goes bad, or cosmic radiation or low power changes its value, the parity bit's setting will no longer be correct for that byte. To protect you from the erroneous results that might occur if you were allowed to continue computing with corrupted values, the system shuts down.

Parity check 1 refers to a problem with motherboard memory; parity check 2 refers to memory on a card in a slot. If a memory chip is defective, it obviously must be replaced. However, when parity errors are intermittent, you can try to fix the problem by cleaning the card's edge connector with a pencil eraser and pushing the chips firmly into their sockets. Setting a heavy monitor atop a weak system unit can also cause parity errors. The weight depresses the top of the system unit onto the memory card, weakening its electrical connection to the expansion slot.

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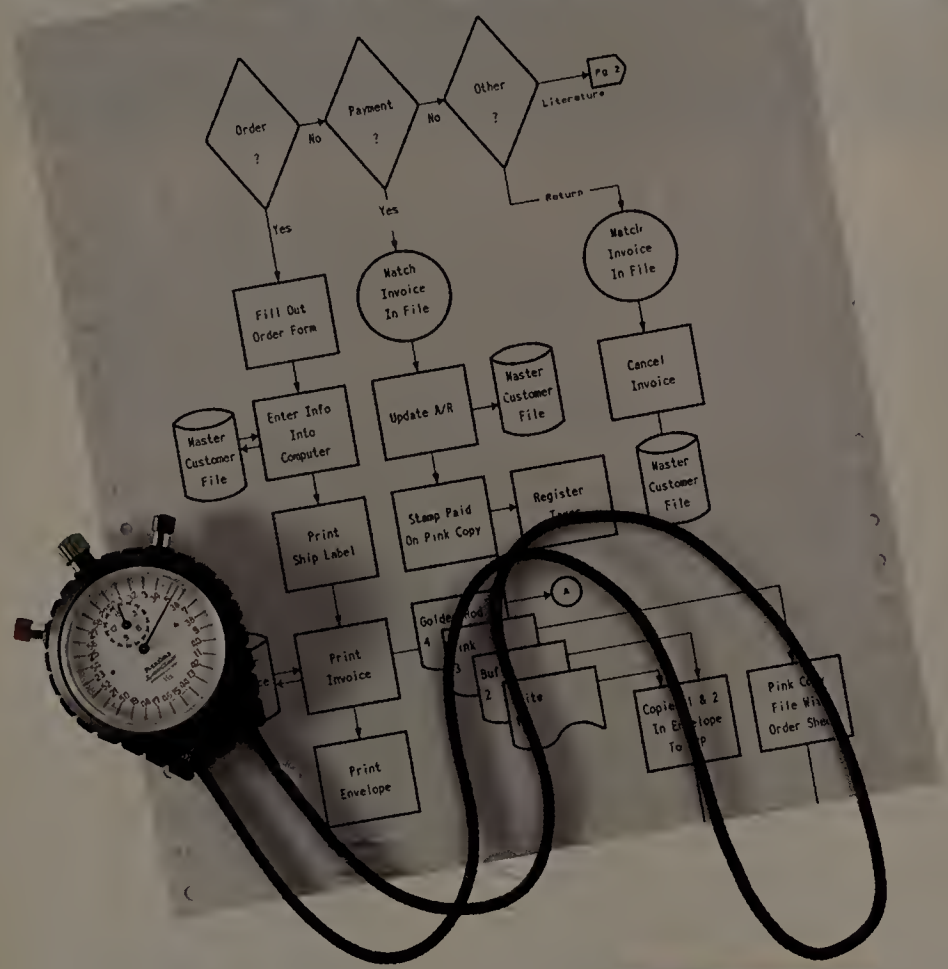

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DeskJet Fonts

Q. *After reading "Font Fortune" in April's* Help Screen, *I wondered how I might expand my Hewlett-Packard DeskJet printer's font library. Are there any multifont cartridges (such as Pacific Data Products' 25 Cartridges in One) available for the DeskJet? Are there any soft fonts (in addition to those offered by HP) for my ink jet printer?*

Robert Brockland
Lemont, Illinois

A. HP DeskJet and DeskJet Plus owners can now gain full compatibility with HP's recently introduced DeskJet 500 (see last month's *Product Outlook*). For a mere $225 or $175, respectively, plus shipping, HP will replace your printer's internal electronics, stick a new label on its case, and ship it back to you. But even if you do take advantage of this great offer, you'll still want to consider the following products.

The number of fonts that a DeskJet cartridge can hold is limited by the printer's design, so producing cartridges like 25 Cartridges in One for the DeskJet isn't possible. There's also not much soft font support for the DeskJet. Koch Software Industries has a utility called *Jet>Desk* that lets you download LaserJet soft fonts to the DeskJet, but using it means investing in 128K printer memory cartridges. A better solution is Metro Software's *LaserTwin* (although the package has an annoying copy protection scheme).

LaserTwin enables you to use a dot

(continues)

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The Joneses.

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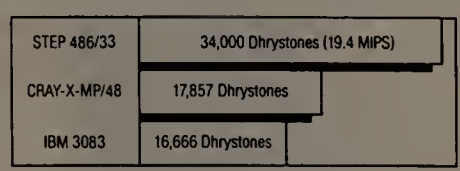

There are two reasons. The first, of course, is the 486™ chip. The other is AMMA,™ Everex's proprietary Advanced Memory Management Architecture.

AMMA uses "write-back" cache technology instead of the "write-through" technologies used in most PC's. The write-back cache was developed for mainframes. Everex was the pioneer in developing it for the PC. And in doing so, opened a whole new dimension in desktop performance.

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And how to keep up with them.

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Circle 73 on reader service card

matrix or ink jet printer as though it were a LaserJet Series II printer. You tell your software that you're printing to a LaserJet and download LaserJet soft fonts (such as those available from Mephistopheles Systems and Weaver Graphics, among others) just as you would to a LaserJet. *LaserTwin* actually stores the fonts on your hard disk, unbeknownst to the downloading program or to your applications. Your DeskJet will be able to do just about everything that a real LaserJet can, including landscape printing.

Metro even has a companion product, *SuperFonts 25/1*, that builds disk-based "virtual cartridges" emulating HP's original 25 font cartridges A through Z. *SuperFonts 25/1* is easier to use than downloading software. You simply use included software utilities to "insert" and "remove" the virtual cartridges into and from your "LaserJet."

You might also consider Atech Software's *Publisher's Powerpak* or Power Up's *Express Publisher*, which work with virtually any printer. *Publisher's Powerpak* is a scalable soft font program that comes in *WordPerfect/PlanPerfect/Microsoft Word/Microsoft Works* (*PP-WP*), *PFS:First Publisher* (*PP-FP*), *Ventura Publisher* (*PP-VP*), and *Microsoft Windows* (*PP-WN*) versions. *Express Publisher* is actually a desktop publishing program—its fonts can't be used by other programs. With either package, fonts are scaled on the fly, conserving disk space, and no additional hardware or memory is required. Each program comes with three scalable typeface families (each has several styles). Atech offers additional typefaces at $29.95 a pair. Power Up has three *Express Fonts* packages, each with two faces, at $59.95. *Express Publisher* also accepts any Type Director (HP-compatible) laser soft fonts.

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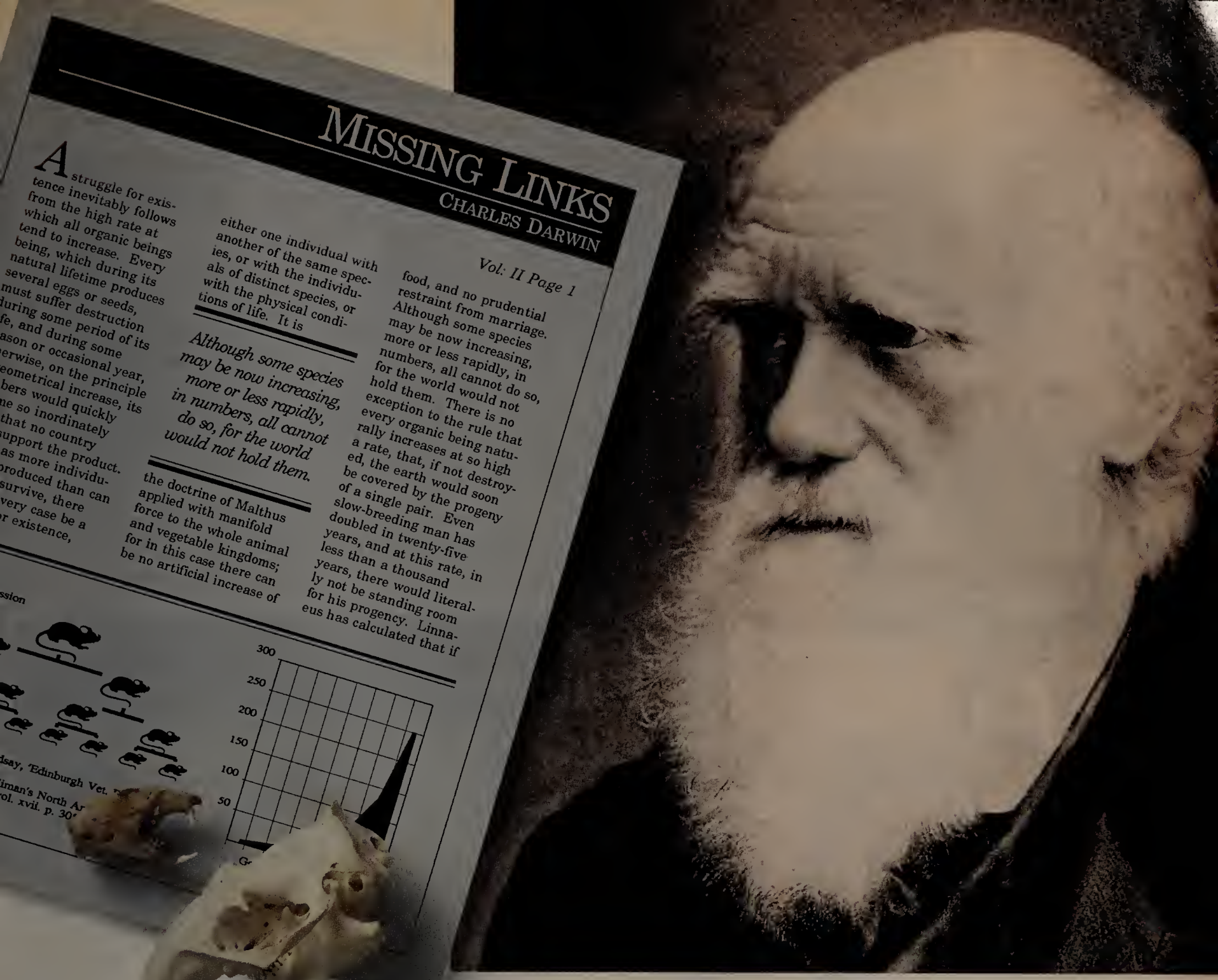

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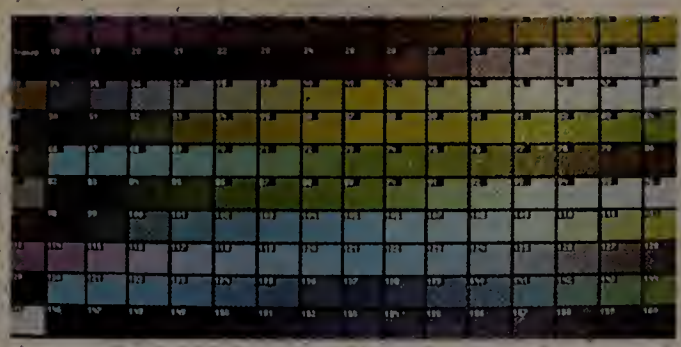

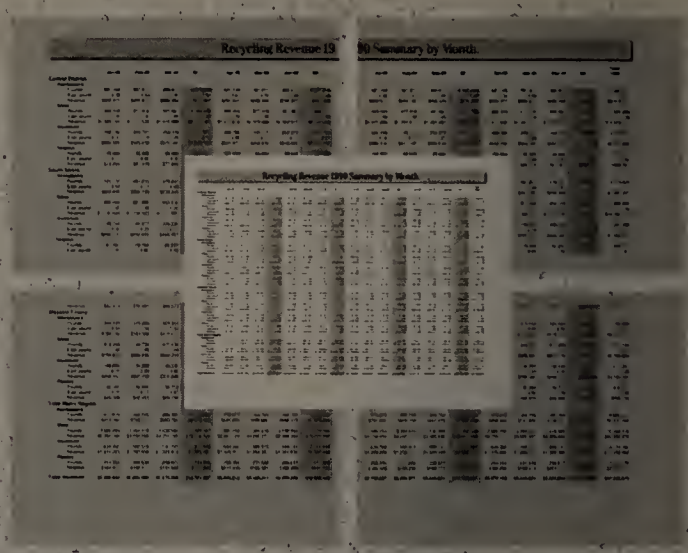

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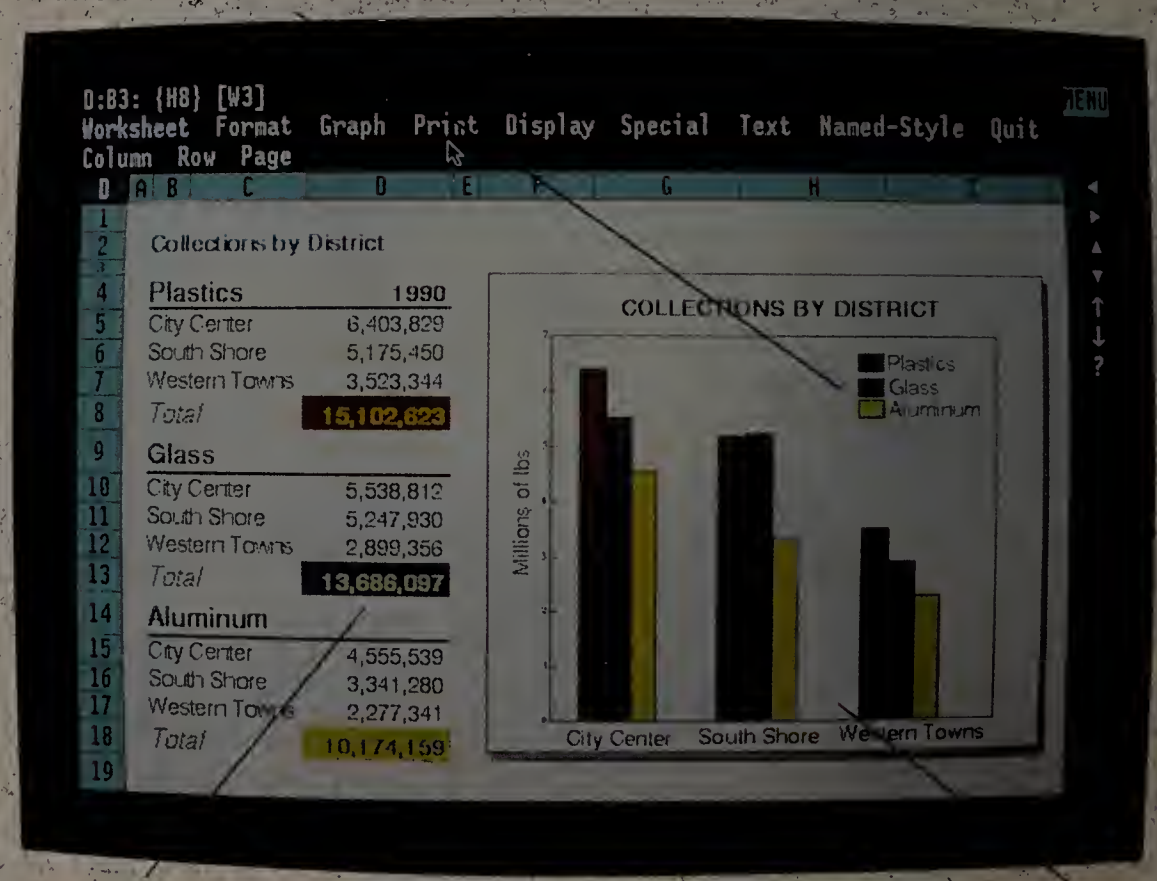

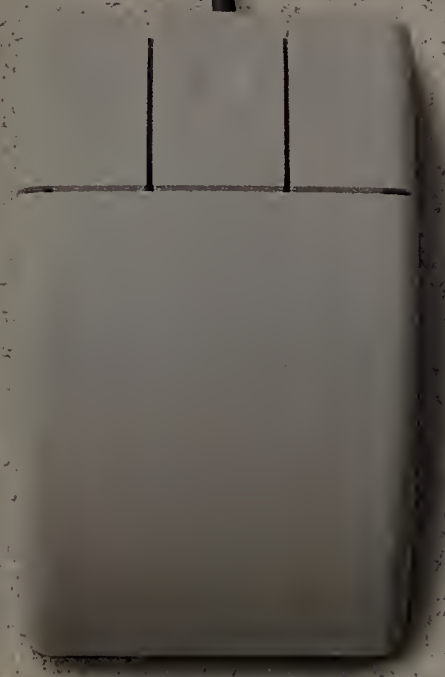

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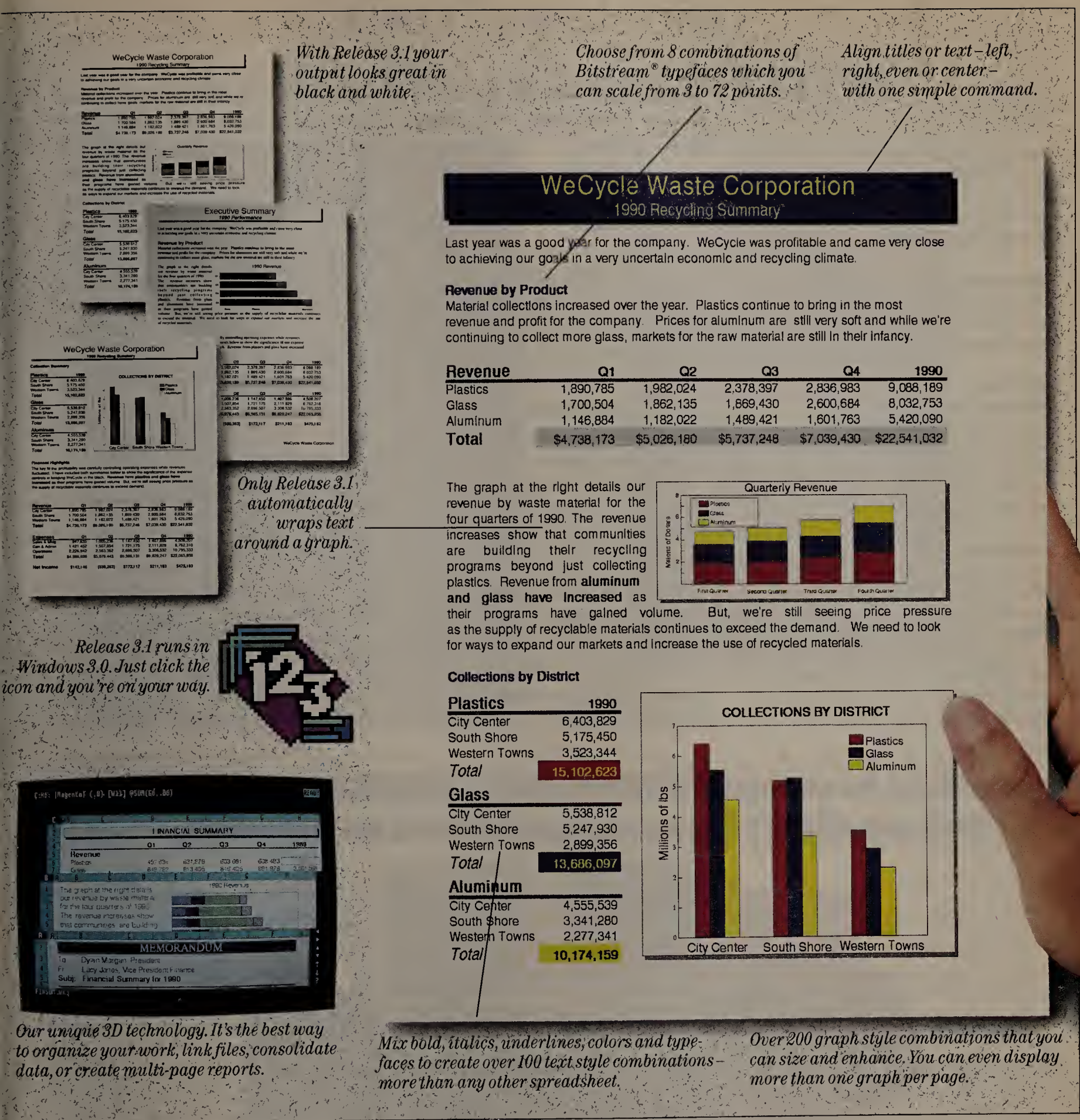

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For more information about all products in this section, circle reader service no. 904.

Blanks a Lot

Q. *I tried BLANK.COM (from "Drawing a Complete Blank,"* Star-Dot-Star, *June, 1990). It certainly blanks my PS/2 Model 55's color screen. However, I can't get back the DOS prompt or the cursor. I try pressing keys, but to no avail; I have to reboot. Any advice?*
Kathleen J. Meyer
Fargo, North Dakota

A. June's BLANK.COM utility does not function correctly on PS/2s and many other systems. However, you can easily fix the problem. Just rename the utility BLANKER.COM and create a batch file called BLANK.BAT that contains two commands, **blanker** and **c:\dos-\mode co80**. (Change the MODE command, which resets your color monitor, as needed if MODE.COM is in a different drive/directory. Also change *co80* to **mono** if you use a monochrome monitor.) Press <**Enter**> to bring back the screen.

Note that to blank the screen, you must exit your application and manually run BLANK. If you want the screen to blank automatically after a set number of minutes of keyboard (or mouse) inactivity, you should invest in a commercial memory-resident screen blanker. BLANK.COM is meant only as a temporary solution for users who have an application that is incompatible with their current screen blanker.

How does...? What can...? Should I...? Send your PC questions to The Help Screen, PC World, *501 Second St. #600, San Francisco, CA 94107-1431; CompuServe 74055,412; MCI Mail PC World Editorial; or 415/442-1891 (fax). Questions with the broadest appeal will be published.*

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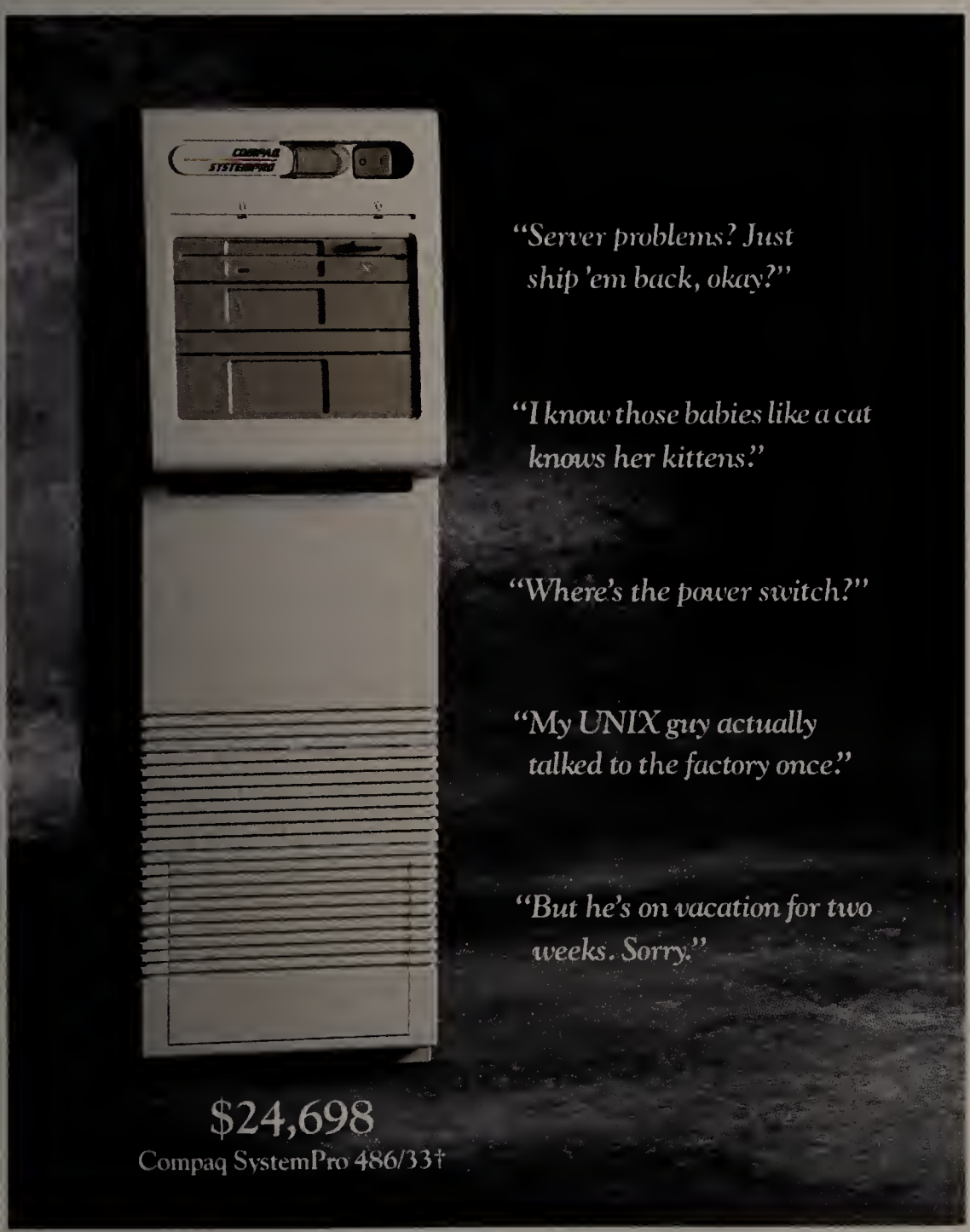

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There's a lot more to know before you buy a server. When you call Dell, our experts will give you the help you need to buy an advanced PC or UNIX server.

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AUGUST 20, 1990

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Price			$495	$695	$595	$695	$495	$495	$295	$299
Performance										
Drawing/editing	(150)	( )	Good	Very Good	Very Good	Very Good	Very Good	Very Good	Satisfactory	Good
Tracing	(50)	( )	Very Good	Very Good	Very Good	Excellent	Very Good	Satisfactory	Poor	Good
Import/export	(50)	( )	Satisfactory	Satisfactory	Very Good	Very Good	Good	Good	Satisfactory	Very Good
Speed	(50)	( )	Satisfactory	Very Good	Excellent	Good	Excellent	Satisfactory	Good	Good
Output quality	(100)	( )	Good	Good	Excellent	Very Good	Excellent	Very Good	Satisfactory	Satisfactory
Documentation	(100)	( )	Very Good	Good	Very Good	Excellent	Very Good	Good	Satisfactory	Satisfactory
Ease of learning	(100)	( )	Very Good	Good	Excellent	Very Good	Satisfactory	Good	Very Good	Good
Ease of use	(125)	( )	Satisfactory	Very Good	Very Good	Very Good	Satisfactory	Very Good	Satisfactory	Very Good
Error handling	(75)	( )	Good	Poor	Good	Good	Good	Very Good	Good	Very Good
Support										
Support policies	(50)	( )	Satisfactory	Good	Good	Very Good	Satisfactory	Satisfactory	Satisfactory	Good
Technical support	(50)	( )	Satisfactory	Very Good	Very Good	Very Good	Good	Good	Very Good	Very Good
Value	(100)	( )	Satisfactory	Good	Excellent	Very Good	Very Good	Very Good	Satisfactory	Very Good
Final scores			**6.0**	**6.4**	**8.2**	**7.7**	**6.9**	**6.8**	**5.4**	**6.5**
Use your own weightings to calculate your score										

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Circle 48 on reader service card

NETWORK Q&A

Freeing Workstation Memory

Keith Nickerson

Q. *With all of the necessary drivers, shells, and memory-resident [TSR] programs loaded into my workstation's RAM, I don't have enough memory left over to run large programs like* Ventura Publisher. *What can I do to regain some of my workstation RAM?*

Stan Hunter
Ventura, California

A. Your problem is endemic to LAN workstations. Until recently, NetWare users had to dedicate nearly 80K of conventional memory to the low-level network protocols (IPX) and the NetWare shell. Novell's new shell, version 3.01, lets you install most of the shell's code (but not the IPX protocols) in expanded or extended memory. The new shell uses only about 7K of conventional RAM, compared to more than 40K for the previous version, and needs 64K of expanded or extended memory.

You can get the shell (actually, there are three—one each for expanded and extended memory, and an updated conventional memory version) from CompuServe free of charge, except connect fees. Allow about an hour to download everything. Type **go ndd** at any CompuServe prompt. Four files, DSWIN1.ZIP through DSWIN4.ZIP, make up the complete shell. A text file in the NDD download forum tells you what these files are and how to install the new shells.

The new NetWare shells are a blessing, but you may need more memory than they free up. Additional steps you can take to reclaim precious RAM for application use range from the simple to the complex:

Trim TSRs Pop-up accessories are definitely convenient but can be addictive. Several utilities let you load and unload TSRs on demand, freeing conventional memory. These utilities include Bloc Publishing's *Popdrop* and *Marknet* and *Relnet* (available as MRKREL.ARC in the Public Domain/Demo Library of the Novell A Forum of CompuServe's NetWire forum).

An even better, though more expensive, solution is to run TSRs in upper (between 640K and 1MB), expanded, or extended memory. For 8088-, 8086-, and 80286-based machines, you can use an add-in memory manager card such as the HiCard from RYBS Electronics or the ChargeCard from All Computers. The HiCard works with machines based on any Intel microprocessor; the ChargeCard is exclusively for 80286-based machines.

On 80386-based machines, you can use expanded memory manager software (EMMs) to emulate expanded memory. *QEMM-386* by Quarterdeck Office Products, *386-To-The-Max* by Qualitas, and *Windows 3.0* by Microsoft are examples.

Clean Up CONFIG.SYS Another RAM-resuscitation trick is to prune your CONFIG.SYS file entries down to the essentials. For example, if you rely mostly on network drives, DOS buffers are practically useless—you can reclaim the 512 bytes each buffer consumes. Put in the line **buffers=0** (don't just omit the command—DOS defaults to 2 or 3, depending on the version and type of machine).

Further, the LASTDRIVE= command, which sets the number of available local drives, is unnecessary. In DOS versions higher than 3.0, the default last drive is E, allowing plenty of drives for most networked users. You can omit this command and gain about 2K of RAM. Finally, most people never use the ANSI.SYS console device driver. If you can live without its fancy screen colors and prompts, you'll save 2K to 10K, depending on the version.

Move That Stack Network protocol stacks—drivers that let your computer move data onto and off of the LAN—are the last place to save scraps of RAM. LanSystems' *LANSpace* utility, although rendered partially unnecessary by the new NetWare shell, remains useful because it lets you load IPX into the first 64K of extended memory on an 80286- or 80386-based computer. IPX can hog 20K to 50K, depending on the kind of computer and network adapter you use.

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800/627-4825, 416/960-5426 (fox)
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HiCard
RYBS Electronics
2590 Central Ave
Boulder, CO 80301
303/444-6073, 303/449-9259 (fox)
LIST PRICE: $299–$639, depending on system
Reader service no. 821

LANSpace
LANSystems Inc.
300 Park Ave. S
New York, NY 10010
800/458-5267, 212/995-8604 (fax)
LIST PRICE: $495 (version 2.0 will be $595)
Reader service no. 822

Popdrop
Bloc Publishing
800 S.W. 37th Ave. #765
Corol Gobles, FL 33134
305/445-0903, 305/444-5010
LIST PRICE: $49.95
Reader service no. 824

QEMM-386
Quarterdeck Office Systems
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Santo Monico, CA 90405
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(continues)

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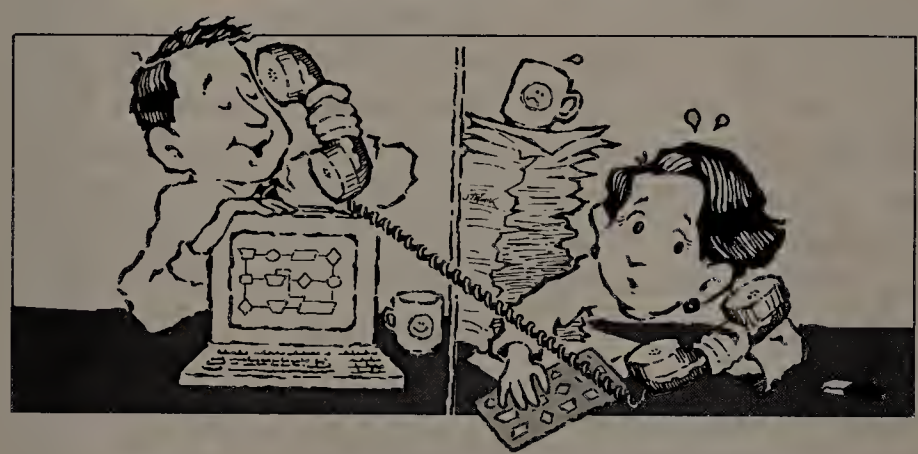

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NETWORK Q&A

(continued)

Reader service no. 825

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Bethesda, MD 20814
800/733-1377
LIST PRICE: $130
Reader service no. 826

Windows 3.0
Microsoft Corp.
One Microsoft Way
Redmond, WA 98052-6399
206/882-8080
LIST PRICE: $149
Reader service no. 827

For more information about all products in this section, circle reader service no. 906.

Keith Nickerson is the editor of NetWare Advisor *and a member of the publishing team of Business Systems Group, a Houston-based network consulting firm.*

POWER TIP NO. 151

Shrinking Your PageMaker Files

When *PageMaker* saves a file, it saves the changes you've made since the last two saves, enabling you to *Revert* to previous versions of the document but also creating a larger file. To shrink a *PageMaker* data file up to 50 percent, depending on the type of elements you've changed, save your file with *Save as* while keeping the same name. Be warned: After doing this, you won't be able to use *Revert*.

Ed Vavra
Winchester, Virginia

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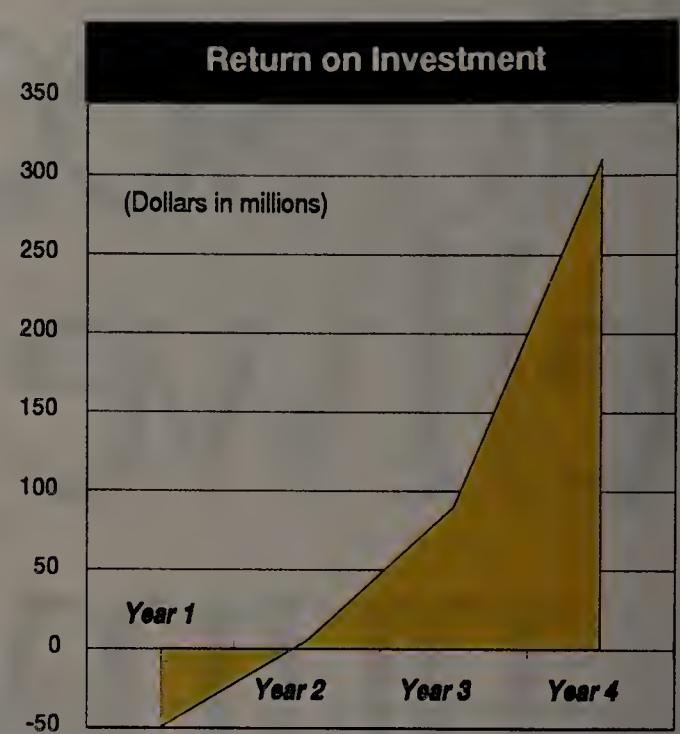
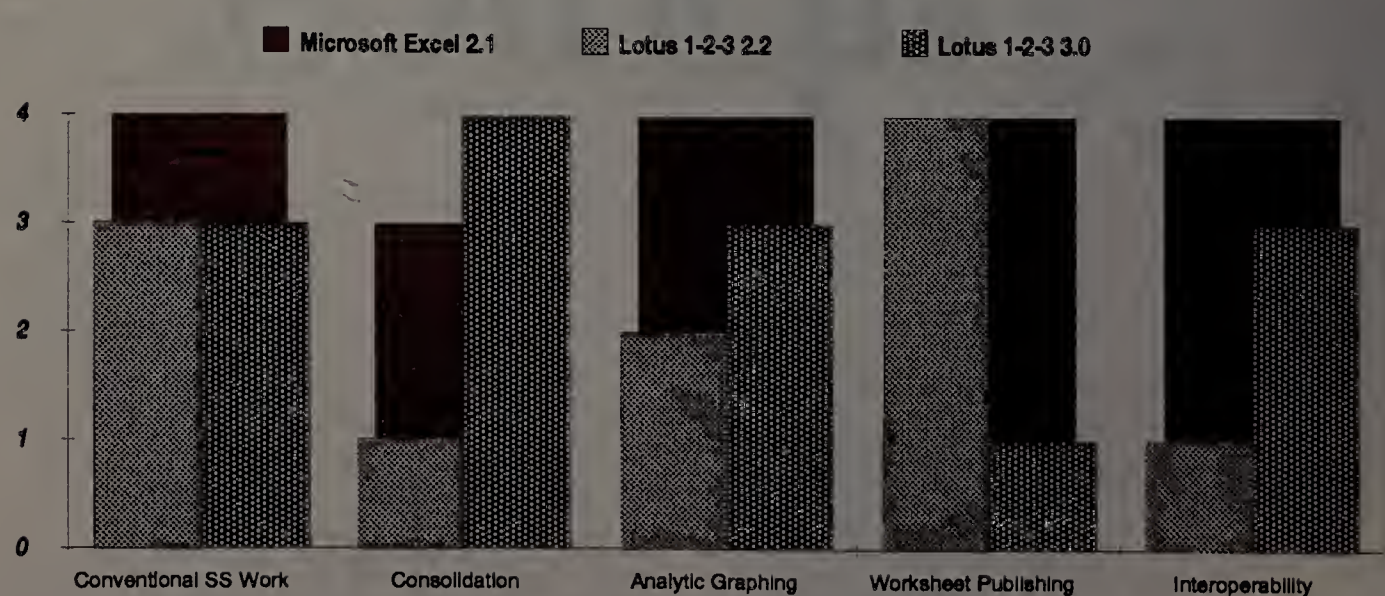


*Based on the findings of a recent study, switching to graphical applications can yield increased productivity and can result in these dollar savings. ****

Recently, *PC Magazine* placed Microsoft Excel version 2.10 head to head with Lotus 1-2-3 release 2.2 and 3. They measured the essential criteria by which spreadsheets are judged. As you can see from the chart, Microsoft Excel proved to be superior in its balance of capabilities. Further evidence of the advantages of the graphical-based Microsoft Excel over the character-based Lotus 1-2-3 can be seen in a recent study.

Over the years, graphical-based applications result in significant dollar savings since they are faster to learn, faster to use and less frustrating to master.



In this chart, PC Magazine** *compares the salient spreadsheet criteria of Microsoft Excel and Lotus 1-2-3. As you can see, Microsoft Excel showed its superiority.*

(Incidentally, this report was created using Microsoft Excel linked with Microsoft Word for Windows.)

For more information, call (800) 541-1261, Dept. M67. Outside the U.S. and Canada, call (206) 882-8661. In Canada, call (416) 673-7638. ©1990 Microsoft Corporation. All rights reserved. Microsoft and the Microsoft logo are registered trademarks and Ma
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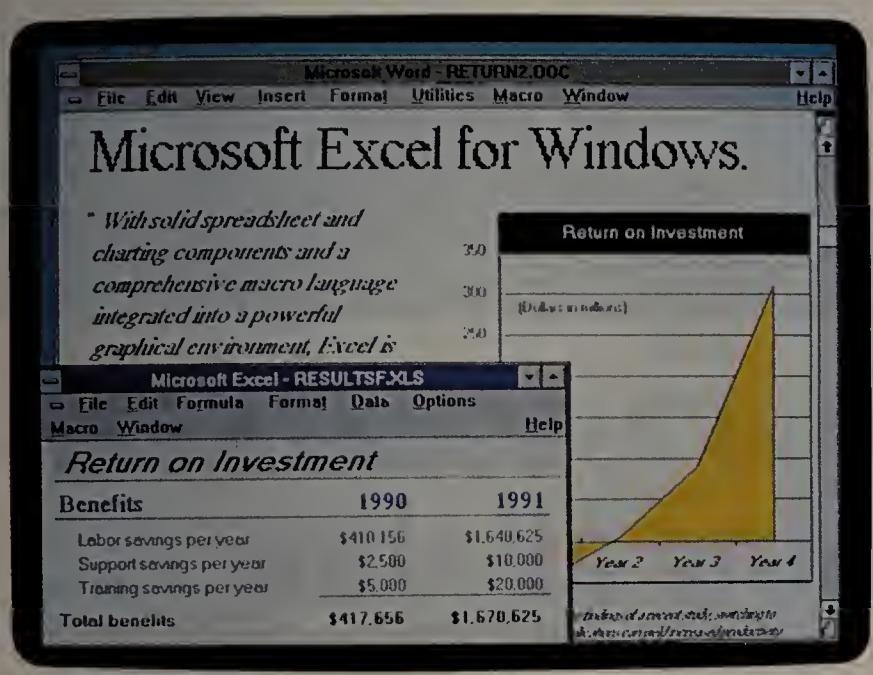
If you read the report at the left, you can see in just a couple of seconds how well Microsoft® Excel for Windows™ can crunch numbers.

Which is exactly our point.

Whatever analytic case you're making, it's much more easily made with a comprehensible, bottom-line report than with a row and column spreadsheet.



Windows can display Microsoft Excel and Word for Windows at the same time so you can see how all elements of your analysis will go together.

And that's not to give up one iota of analytic power.

Fact is, Microsoft Excel gives you more power to make sense of numbers than any other spreadsheet going. Simply because whether you're analyzing or reporting, you get the power of the Microsoft Windows environment every step of the way.

For instance, you can display multiple spreadsheets simultaneously. So you can see all your data and all the relationships at once.

If you want to link a couple of those spreadsheets, just point, click.

And consider it done.

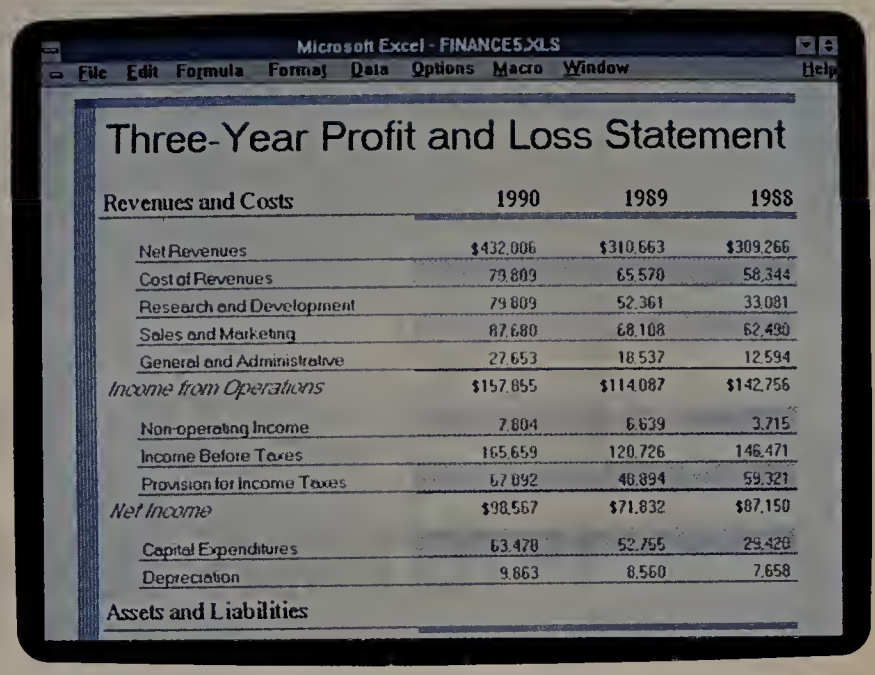
Or if you want to pull data from a variety of databases, you guessed it. Point, click and done.

Then before you wind up, you can do an audit of every formula to give you absolute confidence in your result.

And onto the finish. Which is where your results will really shine.

You can simply dress up your spreadsheet with color, shading, borders and a variety of type fonts.

Or you can chart your numbers hundreds of different ways to make them look really impressive.



Under the Windows environment, WYSIWYG lets you see exactly how your work will print out while you're creating it.

Then when you want to pull out all the stops, you can easily create full-blown reports that mix text, graphics and data. Just copy and paste using other Windows applications, like Word for Windows.

And if you're starting to worry about change, don't. Microsoft Excel reads and writes Lotus® 1-2-3® files. So making a change for the better is easier done than said.

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mmunications Company. ***"The Benefits of the Graphical User Interface" prepared Spring 1990, by Temple, Barker & Sloane, Inc.

Get the best of Windows and OS/2 without learning all this.

Sure, you want to get your PC flying. With features like multiple open applications and background printing. Maybe even the ability to maintain your host connection while you work on something else.

But for that you need Windows or OS/2. Which means you also need to learn enough to get a pilot's license. And spend enough on hardware and software for a down payment on a jet.

But with new Software Carousel, you can get the biggest benefits of Windows and OS/2 by doing almost nothing.

PC MAGAZINE EDITORS' CHOICE
October 30, 1990
Software Carousel, Version 4.0

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Software Carousel got to be a best-seller because it works. Simply and reliably. Day in and day out.

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Now with Print'N'Run.

Thanks to Print'N'Run, new Software Carousel is also an advanced print handler. One that quickly takes over your printing jobs by accepting all the output bound for the printer, then sending it to the printer as fast as it can take it.

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OLÉ is the optional Open Link Extender* for Software Carousel. And it could be the best thing to happen to networks since OS/2 itself.

With OLÉ and Software Carousel, you can connect to any host or service over a network—whether it's a mainframe, a mini, etc.—then "switch away" to work on another application, and not lose your connection.

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And OLÉ works with all kinds of connection software. Including IBM, Attachmate, and others. Without changes to your hardware or software.

Even the experts agree.

Garry Ray, writing for PC Week, said, "Of these alternative operating environments (OS/2, DesqView and Software Carousel), Carousel may be the best choice of the day."

Barry Simon of PC Magazine concurred with, "...I find it difficult to imagine using my computer without Carousel. This package has become an essential tool and one that I strongly recommend."

So if you really want the major benefits of Windows and OS/2, don't get grounded with high cost and mind-bending complexity. Take off today with Software Carousel. It's easy. And it's just $89.95.

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*Open Link Extender is sold separately. †Requires NetBIOS connection.

Circle 23 on reader service card

CONSUMER WATCH

Advice and information for the computer consumer

Research has linked video display terminals to various health problems. What can you do to protect yourself?

Roberta Furger

PC Monitors: Minimizing the Risks

If you're like most PC users, the steady stream of news stories on the potential health hazards of video display terminals has left you feeling more than a little helpless. Your job depends on the daily use of a computer, yet recent studies indicate that you may be jeopardizing your health by sitting in front of a monitor for hours on end. It's hard to imagine a more frightening issue when it comes to PC use—or one that can generate more heated debate among scientists, industry executives, and users.

At the heart of the controversy is concern about the low-level radiation that computer monitors emit—specifically, the effects of two types of low-frequency electromagnetic emissions, those at very low frequencies (VLF) and those at extremely low frequencies (ELF). Historically, much attention has been focused on VLF emissions and their possible link to miscarriages and birth defects. But currently ELF emissions—which originate from power lines, TV sets, and many standard home appliances as well as from computer monitors—cause just as much concern.

Beginning with a series of *New Yorker* articles in June 1989, questions about monitor safety have come crashing home for users and vendors alike. The response has included everything from legislation mandating further research to a continuous barrage of products claiming to protect users from potentially dangerous rays.

Confusion Abounds

PC industry executives, especially those in companies that manufacture or sell monitors, are quick to point out that no conclusive evidence links VDTs to health problems—whether miscarriages and birth defects or cancer. While such statements are literally true, they tell only half the story: There is no conclusive evidence to show that VLF and ELF emissions *do not* cause any health problems. And a growing body of scientific evidence indicates that there's good reason to be concerned.

Given the lack of "proof" either way, several groups are calling on the federal government to initiate independent research that would develop guidelines for both the manufacture and use of monitors. Certainly, that's the long-term solution. But while scientists continue to study the issue, industry and users alike must act now to minimize the risks. Given the stakes, waiting for the final evidence is foolhardy.

The Industry Response

Faced with increased user concerns,

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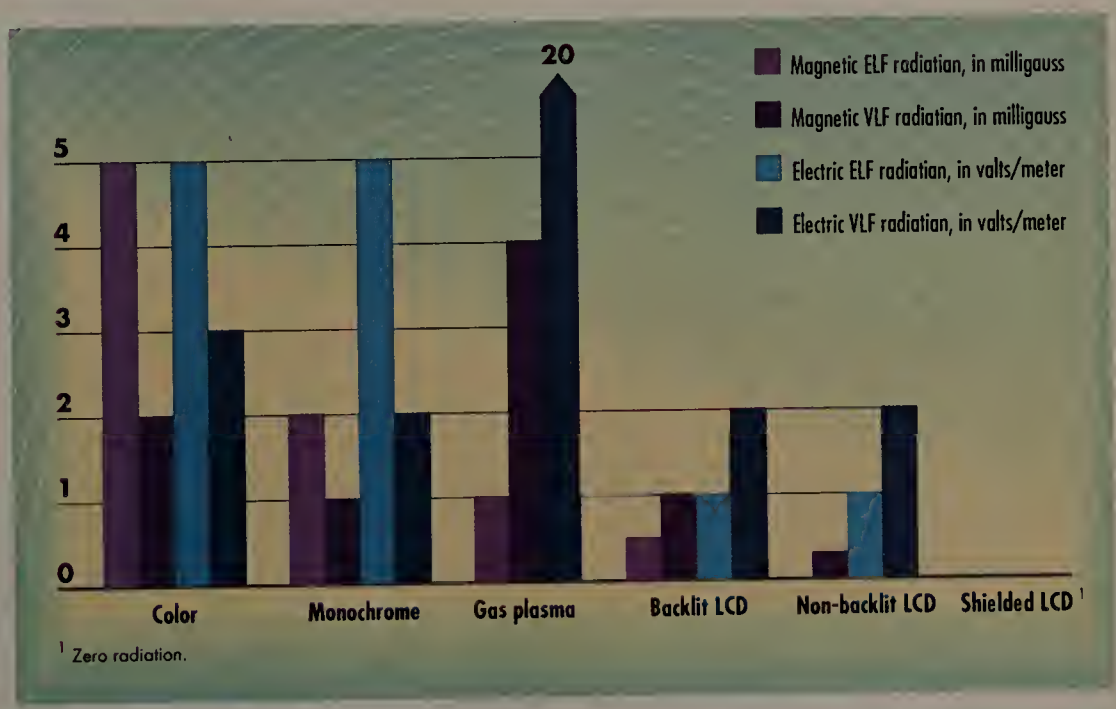
Know the Risks



More colors and higher resolution generally add up to higher emission levels. Monitor shields can protect against electric radiation but not magnetic. Source: Safe Computing.

ANTHONY RUSSO

several monitor manufacturers have introduced low-emissions monitors in the United States. Typically, these units were previously sold in Sweden, where regulations call for more stringent standards to guard against VLF emissions.

IBM was one of the first companies to offer a low-emissions monitor, in its 8515 Color Display last March. Big Blue introduced the unit with little fanfare, simply listing the monitor's very low magnetic field as one of several new features and noting that the "8515 Display meets the Swedish product specification." Both the color and black-and-white displays offered for the PS/1 include similar shielding. More recently, monitor manufacturers Sigma Designs of Fremont, California, and Cornerstone Technology of San Jose began selling their large-screen black-and-white monitors with low VLF emissions in the United States. For the most part, you won't have to pay a huge premium for the added protection. The IBM monitors are priced competitively, while the low-emissions Sigma and Cornerstone models cost approximately $200 more than the standard monitor. Unfortunately, only the IBM monitors are designed for general-purpose use.

Each of these companies cites customer demand, not safety concerns, as the motivation for offering their low-emissions products. The 8515 Display protects against VLF radiation "because customers have asked for it," according to an IBM spokesperson.

Up until the wave of press reports earlier this year, "customers had no interest at all [in the low-emissions monitor]," says Cornerstone president Tom Van Overbeek. Now, he says, the phone rings constantly, with people asking about low-radiation options.

In fact, where it once was taboo to discuss monitors and radiation, several companies are building marketing campaigns around their new-and-improved products—being careful to emphasize, however, that they don't believe users to be at risk.

Not a Complete Solution

Although a positive first step, this new breed of monitors comes from only a handful of companies. What's needed, say many, is an industrywide response. Cornerstone's Van Overbeek believes the industry should rally behind the Swedish standards until further studies are conducted in the United States. Such a move by all monitor manufacturers would make for a level playing field, he says.

But reducing VLF emissions is only a partial solution. The Swedish guidelines do nothing to reduce ELF emissions, which many scientists suspect may be more dangerous. Workers in Sweden are calling for monitors that protect against both types of emissions.

Sigma Designs has organized a company task force to research ways of shielding ELF emissions. The company pledges to offer a low-ELF and -VLF monitor to U.S. buyers during the first quarter of 1991.

Monitor manufacturers aren't the only ones jumping on the low-radiation bandwagon. Manufacturers of antiglare shields are bombarding the market with products that they claim will protect users from harmful radiation. Experts agree, however, that the shields on the market protect only against electric emissions; they do nothing to block the more dangerous magnetic fields. Furthermore, they protect the user only from electric fields emitted from the screen—not from the more powerful ones emanating from the sides and backs of monitors.

One of the few products sold that truly addresses both VLF and ELF emissions is the Safe Monitor from Safe Computing of Needham, Massachusetts. The company claims that these backlit LCD displays produce no detectable emissions. (All LCDs emit electric and, when backlit, magnetic radiation, but at much lower levels than do CRTs. The Safe Monitor is a shielded LCD display that uses soft metals to cancel out the magnetic fields.) Safe Computing president George Lechter proposes LCD displays as the best protection against radiation, and several worker organizations agree.

Take Action

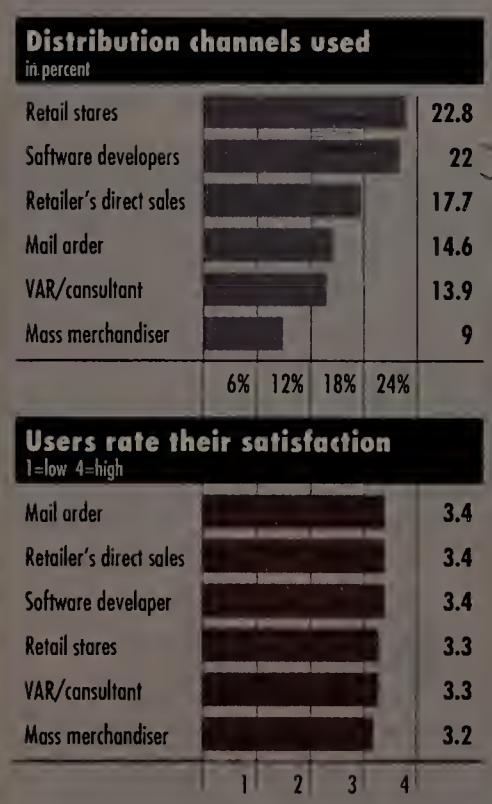
Buying a new monitor may be the safest way to go if you want to avoid electric radiation, but it's not the only solution, and for many it's not an option. Consider the following alternatives, and act now to protect yourself and your co-workers.

- Be informed. Read up on the subject and begin to cut through the jargon

(continues)

RATE YOUR SATISFACTION: Software Distribution Channels

Retail stores represent the channel of choice for software purchases, although buying directly from the developer remains popular, according to this survey of large organizations. Mail-order purchasing, which in the past accounted for a significant percentage of software purchases, is declining in popularity—perhaps due to the growing emphasis on service and support. Regardless of the channel they chose, users generally are satisfied with their method of purchase.



Source: International Data Corporation. From a survey of 200 large organizations, each with at least 50 PCs.

The numbers outside.

486™

386™

to develop an understanding of the issues.

"The first thing we tell people interested in VDT-related issues is to read the literature and make up their own minds," says Laura Stock, associate director of the Labor Occupational Health Program in Berkeley, California.

Stock coordinates the VDT Coalition, a group of unions, VDT users, and health and safety organizations concerned about worker safety issues. For $8 the coalition will send you a 100-page packet of information. Send a check made out to the U.C. Regents to the VDT Coalition, c/o Labor Occupational Health Program, 2521 Channing Way, Berkeley, CA 94720.

- Advocate change. Start by writing your PC and monitor manufacturers to let them know you're concerned. Ask them to clarify their position on monitor safety and to indicate what steps they are taking to address the potential health hazards.
- Then exercise your clout by letting vendors know that their responses will guide your buying decisions. Customer demand is a powerful motivation.

And while you're in the mood, send a note to your state and federal representatives. The House subcommittees on Natural Resources, Agricultural Research and Environment, and the Interior subcommittee on General Oversight and Investigations are reviewing measures to fund research on VDT hazards. Further research is the only way to resolve the health questions, so let your representatives know you consider this a funding priority.

Reducing Exposure

You also can take steps right now to minimize your exposure—and reduce the risk of harmful rays.

- Turn off your monitor. It sounds simple, but most of us leave the monitor running even when we're not using our PC. Flipping the switch may be one of the most productive steps you can take right now to reduce your own exposure and that of your co-workers.
- Keep your distance. The farther you get from the screen, the lower the electromagnetic fields. Using the "extended-hand rule," sit at least arm's length from the monitor.
- Reorganize your office. The sides and backs of monitors give off high levels of radiation, yet in many offices workers are surrounded by the monitors of fellow employees (a standard cubicle divider does nothing to block the emissions). Take a look around your office. Could the desks be reorganized to reduce exposure? Emission levels are virtually undetectable at a distance of 10 feet. At a minimum, you should keep a distance of 4 feet from any monitor.

Over the coming months *Consumer Watch* will be following events related to this issue and will report on what companies are doing to address the poten-

(continues)

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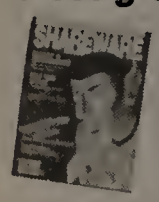
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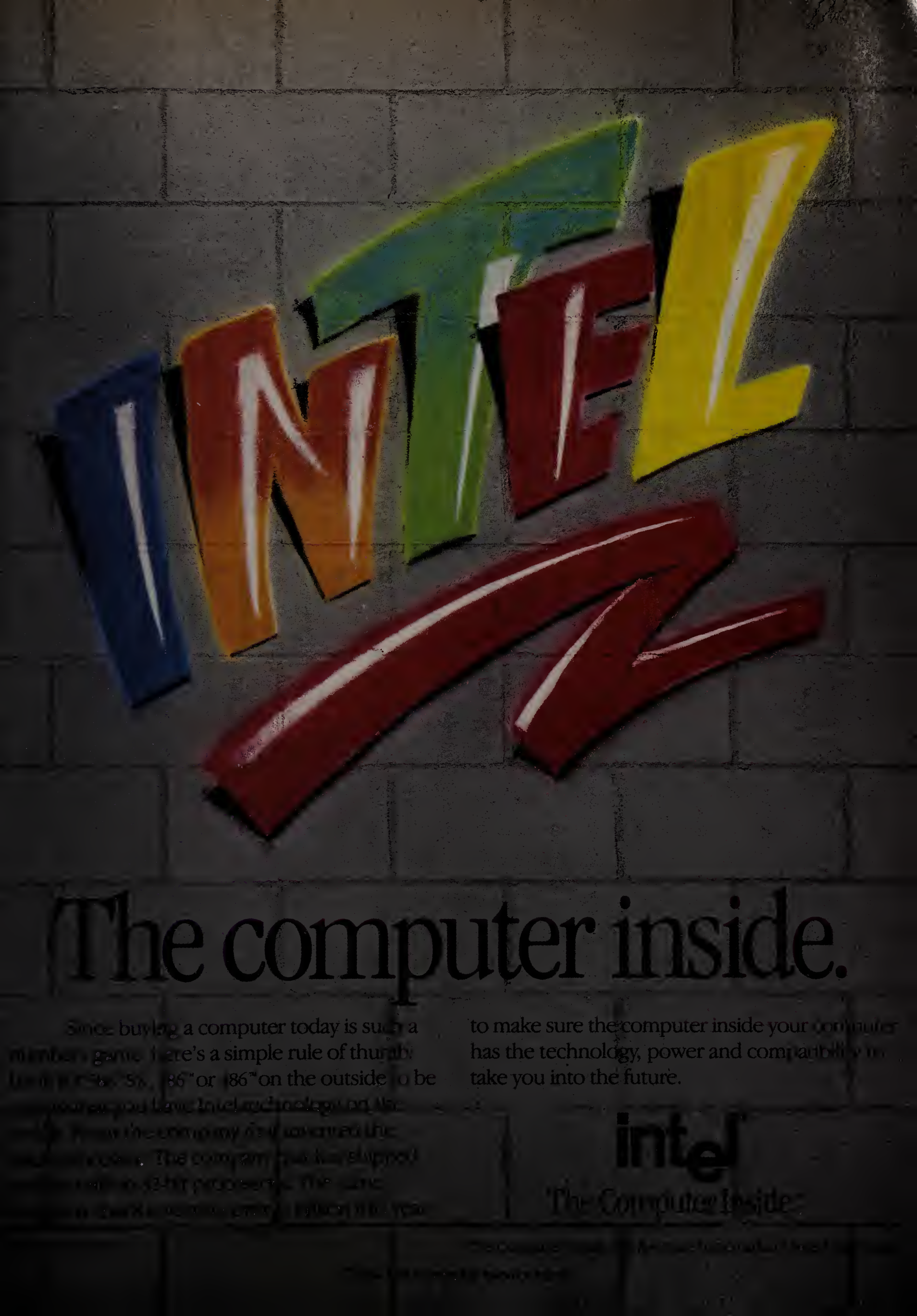

The computer inside.

Since buying a computer today is such a numbers game, here's a simple rule of thumb: look for "386™," "486™" or "i486™" on the outside to be sure you have Intel technology on the inside. From the company that invented the microprocessor. The company that has shipped more than 42 million processors. The company that is working on more than 1,000 different processors this year to make sure the computer inside your computer has the technology, power and compatibility to take you into the future.

intel

The Computer Inside.

The Okidata OK.™ It's why we had to re-invent the laser printer.

What's the Okidata OK? It's a badge of honor that every Okidata product has to earn—a symbol of our commitment to design and deliver products that offer outstanding value and performance. Products that will not only satisfy you, but impress you.

The Laserless Printhead: Warranteed for 5 Years.

The performance promise behind the Okidata OK is the reason we had to re-invent the conventional laser printer. Our engineers frankly rejected the industry-standard page printer technology of laser beams, lenses and rotating mirrors. Instead, they designed and built a proprietary, solid-state LED printhead with no moving parts. It's a printing system so trouble-free, we guarantee our LED print element for 5 full years—making it by far the longest warranty in the industry.

PC MAGAZINE EDITORS' CHOICE June 12, 1990 Okidata OL400

But reliability isn't the only advantage our unique printhead offers. It also means a simpler design, resulting in a straight-line paper path that's far less likely to jam—even when feeding heavy stock, envelopes, or labels. And, since we build it ourselves, it means something else—a lower cost.

The OL400: The Only $999 Page Printer.

Our 4 ppm OL400, for example, has the lowest list price of any page printer on the market: only $999.* Yet that price gets you a printer that earned a PC Magazine Editor's Choice Award, with standard features—extra fonts, a full 200-sheet paper tray—that you won't find on a LaserJet® IIP selling for hundreds of dollars more. Plus a slim, low-profile design that's less bulky on a desktop.

The OL800: Twice the Output, with Room to Grow.

And the OL400 isn't the only Okidata LED page printer to offer outstanding value. For applications where greater speed is needed, the OL800 delivers 8 ppm with all the advantages of the Okidata LED printhead: straight-line paper path, 5-year printhead warranty, and a low $1499 list price.

Like all our LED page printers, the OL800 emulates HP® Series II for compatibility with most popular software; with its speed and selection of resident type fonts, it can handle the printing needs of a whole work group. What's more, as your applications change and your needs grow, a simple upgrade kit turns the OL800 into either a font-scaling OL820 or a PostScript®-compatible OL840.

The OL820: Smarter Than a LaserJet III.

The OL820 earned the Okidata OK by learning how to do font-scaling on the fly. Thanks to a special chip our engineers designed into the 820, it can solve complex type-sizing and positioning problems instantly—problems the LaserJet III needs to talk to its software to work out. That means the OL820 can deliver up to three pages of sophisticated text while the LaserJet III is still working on its first page.

And all at a price that's hundreds of dollars less than the LaserJet III.

The OL840: PostScript and Beyond.

And for applications that require full Adobe PostScript® compatibility, our OL840 delivers it in spades. It's ready to connect to any PC or Macintosh® system, or to both at the same time—then switch between systems with the push of a button.

The Okidata OK. It's a promise that makes our job—to design and manufacture a line of page printers offering both outstanding value and performance—a hard one.

But it makes your job—choosing the right brand of page printer for your application—easier than ever before.

For additional information, call us at 1-800-800-7333.

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tial health risks of electromagnetic radiation. It's in everyone's best interest to confront the issue now.

SHOP TALK

Now That's Service

I recently purchased a U.S. Robotics 2400-baud internal modem from Computer Discount Warehouse (CDW) to use in my Dell System 210 with *Procomm Plus.* After installation, however, the modem and computer wouldn't communicate.

Calls to Dell and U.S. Robotics technical support lines were answered promptly and courteously. I spent approximately two hours on the phone with technical support representatives at the two companies trying to diagnose and solve the problem. Both companies agreed it was either a faulty modem or an incompatibility between the modem and the Dell System 210 and suggested replacing the modem as the most expedient solution. (Dell also offered to duplicate the problem in its laboratory to find a solution.)

I called CDW, which exchanged the modem for a U.S. Robotics external modem, and the problem was solved.

I couldn't have asked for better help from Dell, U.S. Robotics, or CDW. It's good to know these companies support their products.

C. P. Sword
Brookings, South Dakota

More Snappy Service

I bought an Epson LQ-2550 printer and found that *Microsoft Word 5.0* would not drive the two-bin cut-sheet feeder properly in mixed mode.

I sent the details of the problem to Microsoft and a week later received a phone call from a technician who walked me through a process to correct the problem. Unfortunately, the procedure didn't work.

Within a short time, however, Microsoft had acquired an LQ-2550 with a sheet feeder and had assigned a techni-

(continues)

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cian to stay with me until the problem was resolved.

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Henry Sostmann
Durham, North Carolina

Hard Drive Dilemma

We purchased a Toshiba T-1200 in October 1988 and used it quite successfully until January 1989, when the hard drive had to be replaced. The laptop was still under warranty and a new hard drive was installed free of charge.

Then, 12 and a half months later, we were told that again we would need a new hard disk—to the tune of $1088, or almost half the original cost of the laptop. Toshiba advises us that the unit is no longer under warranty.

The question is, should we have it repaired again and hope this isn't an annual event, or should we consider it a throwaway and replace it with a different brand?

David Biddle
Golay Buschel USA, Ltd.
New York, New York

Editor's note: Consumer Watch *contacted Toshiba about Mr. Biddle's hard drive failure and requested information on the failure rate of Toshiba's T-1200 laptops. According to a Toshiba spokesperson, the hard drive failure rate on both the T1200XE and the T1200HB is less than one percent. In light of Mr. Biddle's repeated problems, however, Toshiba has agreed to refund his money for the replacement hard disk and has extended the warranty on his system for one year.*

Think you've gotten a raw deal? Send the details to Consumer Watch, *PC World Editorial Dept., 501 Second St. #600, San Francisco, CA 94107; CompuServe 74055,412; or MCI Mail PC World Editorial. We'll investigate your complaint and publish letters with the broadest interest.*

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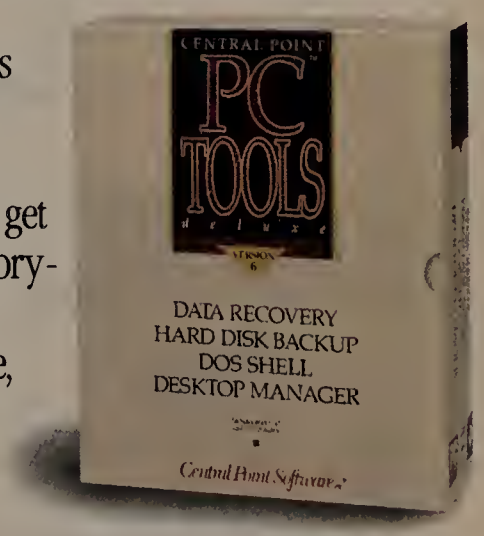

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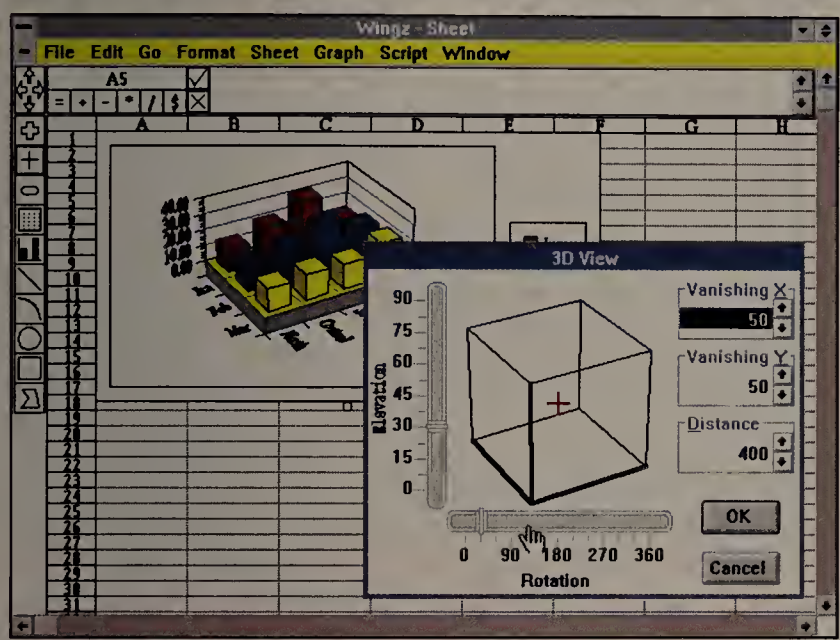
Circle 77 on reader service card

Edited by ERIC BENDER

Development Teamwork Collapses

IBM, Microsoft Conflict on Software

Is a Smooth Windows-to-OS/2 Migration Assured?



While Windows and OS/2 versions of packages like Informix's Wingz may look identical, the environments are incompatible.

The two giants in PC system software have agreed to disagree. They're steering users in opposite directions—which bodes ill for customer investments down the road.

Under a September agreement, IBM will push the OS/2 operating system, while co-developer Microsoft will drop most OS/2 work and concentrate on *Windows* and DOS. With a downsized OS/2 version 1.3 appearing soon, IBM and Microsoft will offer competing graphical environments with almost identical hardware requirements—realistically, a 386 with 4MB of memory and a large hard disk. Microsoft chairman Bill Gates acknowledges the obvious: "There will be overlaps between these products."

In this uneasy alliance, the two companies still jointly own DOS and OS/2 and are cross-licensed on related products—and *Windows*. IBM will develop 16-bit and 32-bit versions of OS/2, with Microsoft focusing on distant "OS/2 3.0" releases for both Intel and non-Intel platforms. This switch raises many questions about what Microsoft has been telling users since 1987. It also creates problems for PC vendors who must license IBM-created OS/2 through Microsoft—a clumsy arrangement.

Since *Windows 3.0* debuted in May, users have jumped on the only graphical bandwagon that carries a full suite of applications. IBM saw the *Windows* wave coming last November and signed Microsoft to a truce that put a ceiling on advanced features for *Windows*. Apparently, though, such restrictions no longer apply. Gates won't be specific, but future *Windows*-DOS combinations presumably could include an improved file system, more advanced multitasking, and a cleaner memory architecture.

Developers Stay on Course

This is a tempest in a teapot for most users now, since OS/2 has met only meager acceptance. And most software developers are relatively unperturbed because their heavy bets on *Windows* don't appear threatened.

Still, software makers expect most users to eventually move to OS/2 and are keeping OS/2 efforts simmering. "Although *Windows* will be successful in the stand-alone DOS world, OS/2 will be dominant in the client-server world," says Fred Gibbons, chairman of Software Publishing Corporation in Mountain View, California.

Corporate customers are "buying machines that are capable of running OS/2 eventually, even if they are only used for *Windows* now," remarks Bill Cornfield, president of The Windows Support Group, a New York consulting firm. "OS/2 remains part of Microsoft's master plan. It's more a question of timing than anything else."

What's the Upgrade Path?

But how will *Windows* users make the transition? Microsoft reaffirmed its promise that OS/2 2.0 will run off-the-shelf *Windows* packages and declared that OS/2 3.0 would do so more elegantly. But the necessary cooperation with IBM will become much harder to orchestrate.

Another user concern: Many early adopters are less than enthusiastic about IBM's versions of OS/2. "IBM's work has been slipshod," says Bob Holmes, systems evaluation manager at Southern California Gas in Los Angeles. Missing drivers, poor documentation, and inadequate technical support have plagued Holmes and other users. —*Alice LaPlante*

OS/2: Who's in Charge?

HARRY AUNG

IBM and Microsoft have broken up their joint development efforts, assigning prime responsibility for DOS to Microsoft and responsibility for OS/2 to IBM.

Software-Only Stores Face Greater Competition

Users Turn Toward Superstores

The marketing was clever, but large selection and low prices were what originally attracted crowds to Egghead Discount Software stores. Since 1984, when Victor Alhadeff opened his first outlet in Bellevue, Washington, the software-only store that maintains more than a thousand titles has seemed unbeatable, especially to the small-business customer. Today, however, it's being challenged by a new breed of retailer that pushes selection and pricing even further.

Besides discounting software 10 to 50 percent, Egghead has always offered a liberal return policy. Customers can return any package for any reason within 30 days of purchase—providing a safety net for buyers.

With its winning combination of price and service, Egghead grew rapidly, hitting almost 200 stores by early 1989. But then the chain faltered financially. One factor was the increased competition from mail-order houses and other software-only stores, such as Walden Software in Stamford, Connecticut, and Software Etc. in Minneapolis. More important, Egghead was suffering the pains of such rapid growth.

However, the chain brought in new management who sharpened operating practices, and it began turning a profit again a year ago. (Egghead's direct sales group, which accounts for more than half of its revenues, also is prospering.)

Superstores Soar

Now Egghead and its rivals face another hurdle: the superstore. The size of the largest supermarkets, these warehouses—stocked with every kind of hardware, software, and peripheral imaginable—are springing up all over, from Soft Warehouse in Dallas to Micro Center of Columbus, Ohio, to Fry's Electronics in Palo Alto, California. "We watch the buildings go up and our parking lots empty out," says a ComputerLand sales manager in Dallas.

The superstores' appeals are selection first and price second, notes Seymour Merrin, president of Merrin Information Services in San Francisco. "A superstore will have over twice as many titles as an Egghead, and they'll all be in stock," says Merrin. The pricing is likely to be a tad lower than a software-only outlet's.

On the other hand, superstores may not be as consumer friendly. "Some superstores have a hard-nosed attitude about returns and don't take products back for any reason, much less because the customer 'just didn't like it,'" points out Jerry Schneider, a Washington, D.C., small-business computer consultant and prominent user group leader.

Superstore critics maintain that the sales staffs are ignorant about the products. "People shouldn't go into one of these stores thinking they will get enough information to make a smart buying decision," says Tracy Licklider, president of the Boston Computer Society.

Some PC users turn instead to mail order, but their numbers seem to be dwindling. "I need immediate gratification," says George Yates, a Houston CPA, summing up why most users avoid mail-order houses. "The discount prices aren't enough compensation for the wait."

Software buyers are virtually unanimous in their distaste for retail computer chains. "Their prices are always higher, and their knowledge is insufficient to be of any real use," says Tom Kelly, a process engineer for OxyChem in Alvin, Texas.

Egghead and its peers won't surrender to superstores without a fight. The superstore chains have yet to span coast to coast, and thus each local software market remains just that: dependent on local influences. If a superstore has arrived in town, it's a good bet that the local Egghead store will drop prices and overstock its shelves. —*Alice LaPlante*

Egghead Back in the Black

After expanding tao aggressively and pasting lasses last year, Egghead Discaunt Software brought in an executive team that boasted efficiency and strengthened financial contrals, bringing the chain back into the black.

Software Superstores on the Rise

Existing software stares such as Walden and Egghead face a strang challenge fram "superstores" led by Saft Warehause. These supermarket-sized autlets, which aim ta stack an even wider selectian af software, are few in number but are spreading rapidly, says Merrin Infarmatian Services.

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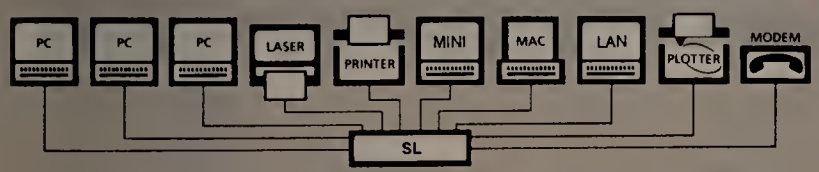

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Heavyweight 486s Remain Niche Products

Most Users Prefer Price/Performance on 386 Machines

High-end machines based on Intel's 486 chip have been shipping for almost a year, but the powerhouses haven't yet found their way into the PC heartland.

Vendors and dealers say interest in 486 systems has been confined to three principal tasks: computer-aided design (CAD), engineering, and network service. For most other business applications, 386-based PCs remain the systems of choice.

CitiCorp is buying 486 PCs for network server jobs, but Roger Bender says 386 machines can handle most desktop tasks.

YVONNE HEMSEY

Slow Ramp Up

Everex Systems in Fremont, California, began shipping its first 486 system, a 25-MHz desktop unit, last December. Sales were slow at first but picked up over the summer and now account for one-tenth of Everex's revenues. "We can't build them fast enough," says Product Marketing Manager Steven Dougherty.

Dougherty attributes the slow initial response to the "natural learning process that goes on whenever a new processor is introduced. A few users have to have it right away, but the majority of them sit back and wait and see what happens."

There's currently a $3000 price differential between Everex's 33-MHz 486 and a similarly configured 33-MHz 386 system, which lists for $5399 with 4MB of RAM and no hard drive. That price jump places the 486 out of range for many users. But for some the dramatic performance advantages of a 486 make it a smart buy, says Dougherty.

"If you need the power, it's well worth the price," agrees Robert Charlton, analyst with Dataquest in San Jose. He notes that in some engineering applications, a 33-MHz 486 system can be up to four times faster than its 386-based counterpart.

386 Meets Business Needs

But when it comes to mainstream business applications, the 386 still fits the bill, and the 486 hasn't created the kind of user excitement sparked by its predecessor.

"The 486 is not going to be commonplace for some time," says Roger Bender, vice president at CitiCorp in New York and former president of the Microcomputer Managers Association. Although CitiCorp has purchased 486-based systems for use as network servers, Bender believes that the need for desktop power is nicely filled by high-end 386 systems.

Most of today's software doesn't demand the power of a 486 chip, says Bender. "You hit the <Enter> button on an upscale 386 and you get a good response," he says. But given time, Bender believes, software developers will write applications with the 486 in mind, as many now write for the 386.

Tighter Budgets, Slower Sales

Bruce Stephen, an analyst with International Data Corporation in Framingham, Massachusetts, says the lukewarm response to 486 systems exemplifies an overall trend toward prudent purchasing. "Budgets are flat, and [customers] are more careful now about how they spend money on systems," says Stephen. IDC expects this year's 486 shipments to total 86,000—a tiny fraction of the 3.725 million shipments projected for 386 and 386SX systems.

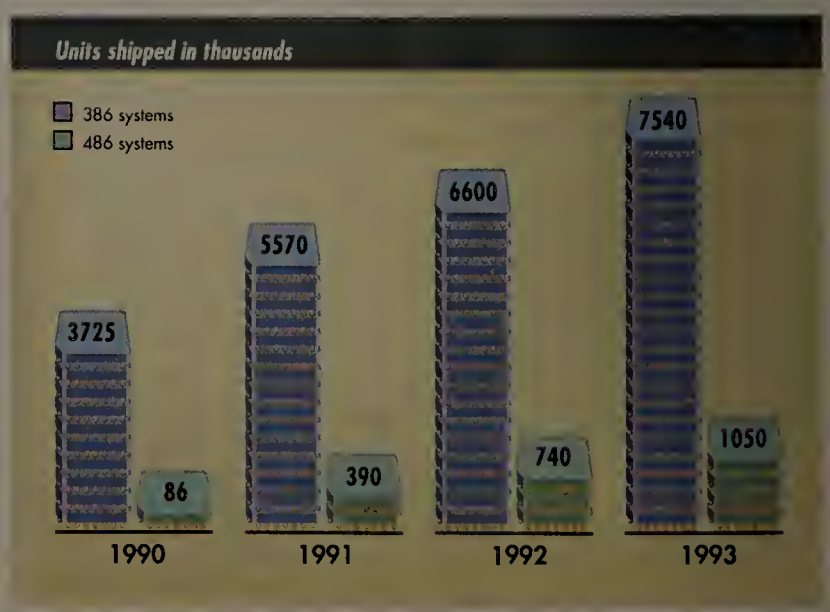
Another factor slowing demand, says Stephen, is that many 486 systems are so-called super servers, high-end systems designed to be alternatives to minicomputers.

Additionally, some vendors have been slow to enter this race—most notably IBM, which didn't introduce full-blown 486 PCs until this fall.

Most observers agree that 33-MHz 486s, which began to ship in volume only this fall, should boost demand. "With all the press about the 33-MHz chip, we didn't sell many 486/25s," says Keith Carter of Necad Northside, a computer dealer in Omaha, Nebraska.

Intel isn't stopping at the 33-MHz version; a 50-MHz offering--close to the limit that conventional system board circuitry can handle—should appear early next year. Despite such rapid advances, we're likely to see "mainstream PCs staying at the 25-MHz level for years to come," says Michael Slater, publisher of the *Microprocessor Report* in Sebastopol, California. —*Roberta Furger*

486 Sales Take Off Slowly



Computers based on Intel's 486 chip will continue to be used almost exclusively as network servers and high-end workstations, and sales won't top 1 million until 1993; 386 and 386SX systems will rapidly become general-purpose PCs. Source: International Data Corporation.

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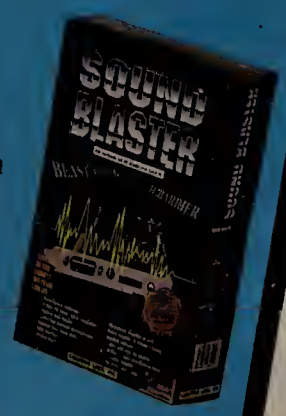

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Circle 86 on reader service card

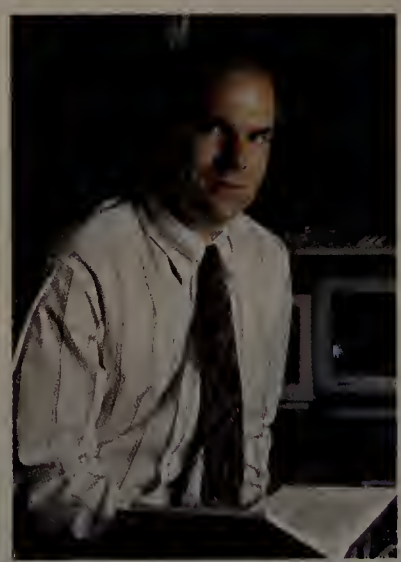
Users Applaud NetWare, Request Better Support

Upgrade Prices Seen as Excessive

Novell didn't gain its dominance in local area network software through dissatisfied customers. Most NetWare users wouldn't think of switching. They praise their favorite LAN operating system for its performance, reliability, and flexibility. But after the paeans are finished, nearly all voice dissatisfaction with Novell's technical support and upgrade pricing.

Better Support, Please

"If you're just an end user, there is no free technical support," protests Bruce Berrens, LAN administrator for Holiday Companies, a Bloomington, Minnesota, wholesale-retail conglomerate. "Novell's response is either 'Give us a credit card number' or to send you back to the reseller. We had a problem with that, since we no longer do business with the company we bought the product from."



"It would be nice if Novell got rid of its voice-mail system and got real people," suggests Jeff Walters.

ERIC BAKKE

Ted Hall, MIS manager for the *Asbury Park Press* in Asbury Park, New Jersey, has "never been able to get a problem resolved through Novell's technical people." He subscribed to NetWare Assurance, a recently discontinued phone support and upgrade service, but "the only thing it did was provide upgrades. The technical support just wasn't adequate."

"It would be nice if Novell got rid of its voice-mail system and got real people," says Jeff Walters, vice president of Denver's Accelerated Bureau of Collections. "When I wanted to know if a particular board would work in my server I had to go through ten levels of menus, then answer a whole lot of questions. It took three days for a guy to call me back to tell me no."

Frustrated by such experiences, NetWare users have turned to each other for help through user groups, bulletin boards, and especially NetWire, CompuServe's Novell forum. "I really appreciate NetWire, especially since they dropped the surcharge," says Berrens. "Our problems have been solved either over NetWire or by talking with other users."

But NetWire isn't the answer to everyone's problems. When Charles Raley, a programmer analyst in the Department of Instructional Media at the University of California at Davis, has problems with his department's LAN, members of his user group tell him to turn to NetWire. "But you have to be comfortable enough with CompuServe to get into NetWire, then you have to wade through the forums to find what you want. It would be very helpful if Novell included a tutorial on navigating NetWire with their products." Walters also finds NetWire intimidating. "It's huge. How do you know what's new? I can't tell. Where do you begin to look? You have to talk with Novell's phone support—at $200 an hour—to find out."

MARC LONGWOOD

Both Nancy and Charles Raley say that their organizations depend on NetWare but often struggle to find technical advice.

The LAN administrators who report to Nancy Raley, manager of office systems for CalFarm Insurance in Sacramento, California, are highly trained. They support CalFarm's large, fast-growing LAN themselves. But occasionally they're stumped by a tough problem. And "the people we have access to at Businessland, ComputerLand, and our other dealers don't have the expertise at the advanced level we need," says Raley.

Her options? "There's NetWire [or] I can hire a consultant," she says. "We go to user groups, but we find ourselves the most experienced of the lot." Raley suggests that Novell make its technical experts available to meet with user groups to help resolve tricky problems. "I know they're worried about their most valuable engineers spending too much time on support, but I've seen this done successfully by other vendors."

Helping NetWare Dealers

How do NetWare dealers rate the support they get from Novell? Bruce Umamoto of America's Computer Center in La Mirada, California, is quite content. "I like Novell's service—it's improved a lot over the last six months, and now it's excellent. I don't get put on hold as often, and when they have to return calls they do it within 15 minutes. That means that when our customers call us with a question, we can get them an answer right away."

But not all dealers are as satisfied. "Whenever I call their dealer support number I get put on hold for half an hour, then they tell me they'll call me back," says Todd Gould, technical director for Loren Data in Santa Monica, California, a custom LAN data base *(see NetWare, p. 86)*

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The new release adds "on-the-fly" downloading of fonts directly to your printer when using WordPerfect or Microsoft Word, to save hours of time and megabytes of disk space. "MoreFonts loads requested fonts directly into the LaserJet, thereby avoiding the hassle of selecting and making separate bitmapped fonts in advance," explained Frank Hainze, president of MicroLogic Software. "Just select any size font from within your application, choose the shading or special effect, and then print. MoreFonts provides more scaling capabilities than either a

LaserJet III or a PostScript printer — for all the HP compatible lasers."

Fonts for Windows 3.0

MoreFonts provides quick installation for WordPerfect 5.01/5.1, Microsoft Word 4.0/5.0, MultiMate 4.0, XyWrite III Plus, Xerox Ventura Publisher 1.1/2.0, First Publisher 2.0/2.1, and all applications under Windows 2.0/2.1/3.0 including PageMaker, Excel, Ami, etc. For Windows applications, Word Perfect and Microsoft Word, MoreFonts supports bitmap as well as scalable printer fonts, with matching screen fonts.

LaserJetIII Support

MoreFonts generates the largest fonts your printer can print (from 2 to 999 point) in the highest resolution possible (300 dpi) on the popular Hewlett-Packard LaserJet III, IIP and IID printers. It also supports the LaserJet Series II, 2000, Plus, 500 Plus, DeskJet, DeskJet Plus, and Dot-Matrix printers (for First Publisher). MoreFonts runs on any IBM PC, XT, AT, PS/2 or compatible with at least 384K bytes of memory, DOS 2.0 or later, and a hard disk.

Thousands of Special Effects On Exhibit

LOS GATOS, CA—Thousands of special effect fonts, created with MicroLogic Software's MoreFonts font generator, went on exhibit today.

"Once you've selected a typeface, you can specify over 50,000 combinations of point size, pattern, outline, shadow, orientation and symbol set," said Dick Brown, president of Brown-Wagh. "So when black type isn't enough, you can combine your choice of 6 outlines, 8 shadows, 27 fill patterns, and 28 background effects for eye-catching variety. You can use a touch of conservative gray or a splash of something really wild."

Critics Say "Thumbs Up" to MoreFonts

Dale Lewallen, PC Week
"MoreFonts could be a one-stop shop for most users. By providing automatic font installation for several different applications, a surfeit of special effects, 40 symbol sets and a good selection of typefaces, the package earns a high rating for value."

David Dean, PC Publishing
"MoreFonts wins on speed hands down. The typefaces included are comparable with typefaces costing more than eight times as much."

Mark Brownstein, InfoWorld
"Even if the fonts weren't so good, MoreFonts would be a great way to experiment with fonts. With the outstanding quality, it's an even better deal."

David Dean, PC Publishing
"Finally the ease of use of MoreFonts should make this a good choice for those just learning about their LaserJet or compatible printer; advanced users will find this package suits all of their font needs."

Benchmarks, LaserJet Journal
"MoreFonts is the overall winner of the seven font generators we tested..."

JULY 1989 TEST RESULTS

Rank	Product	Speed	Font Qty.	Features	Total
1	MoreFonts	7	5	6	18
2	Font Solution Pack	2	6	7	15
3	Type Director	6	4	4	14
4	Glyphix	3	7	3	13
5	Fontware	5	3	2	10
6	Digi-Quilt	1	1	5	7
6	FontMaker	4	2	1	7

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Circle 87 on reader service card

MIS head Ted Hall (center) says that the Asbury Park Press never gets problems resolved through Novell's technical people.

NetWare

(continued from p. 84)

development shop. "So instead I put it on NetWire, and we get a response within 24 hours."

Gould does praise the technical information data base Novell distributes to resellers and user groups. "It's by far the best documentation of any software product on the market," Gould says. "I can quickly find every occurrence of a particular item in all the manuals, browse the actual pages from the printed manuals, and even see the diagrams."

Wanted: Faster Bug Alerts

Users and dealers alike lament the lack of any system to quickly warn them of NetWare bugs and disseminate fixes as soon as possible. "I need to hear about those bugs right away, not over lunch months after they've been discovered," says Jeff Seals, Jr., in-house computer consultant for Sealcore, a Charlotte, North Carolina, ceramic-plant builder. CalFarm's Raley agrees. "Novell needs a mechanism to quickly provide patches, so people with problems affecting their productivity can fix them without waiting for the next upgrade to roll around."

Until Novell comes up with such a mechanism, Seals suggests that the association of NetWare user groups, NetWare Users International (NUI), take on the responsibility for informing users of bugs and fixes. "If a user group discovers a bug or comes up with a great fix, they should give it to NUI to be passed along to all the other user groups."

Michael Wegerbauer, a programmer analyst supervisor in the University of California at Los Angeles psychology department, thinks NetWire could handle the job. "We'd like a NetWire forum dedicated specifically to listing known bugs, so that people don't knock themselves out trying to figure out what's happening. There should be another section for the latest fixes, too."

End Overpriced Upgrades

Most of Novell's customers think NetWare upgrades are too expensive. "I think upgrades should be in line with the price of the product," says Douglas Crum, a Clearwater, Florida, system integrator, NetWare dealer, and president of the Tampa Bay NetWare User Group. For example, upgrading from ELS NetWare Level II to Advanced NetWare 2.15 costs $2065—63 percent of 2.15's $3296 list price. "It's way out of line," Crum declares. "When you can get an upgrade for *PC Tools* for $15 to $30 and it retails for $150, that's reasonable. Ten to 20 percent of list price is a reasonable price for an upgrade."

Upgrading to NetWare 386 is even more expensive. Seals would like to do so but balks at the $4745 price. "That's what we bought Advanced for, four years ago." Bill Spencer, president of Network Communications Technology of Park Ridge, New Jersey, which creates LAN diagnostic and management tools, feels that "if someone's going to have 250 nodes, they should probably pay $8000 for it. But Novell should have a lower-priced version, for 25 or 50 computers, to allow people to migrate from [NetWare] 286."

Robert Dahlen, director of information systems and technology for the University of Denver, takes issue with Novell's plans to sell Macintosh support, global name service, and other features separately. "It's $2000 for this, $1500 for that, another $2000 for that. They're nickel and diming us to death."

Conversely, many users with smaller LANs would like to see NetWare 386's improved memory management, easy installation, and other new features added to the cheaper NetWare 286 line. But Spencer points out a flaw in that approach. "Novell has got to be wasting resources by supporting two environments, so they must be looking ahead to where [NetWare] 286 will disappear. That would be the best thing for the users—and for Novell." When questioned by *PC World*, Novell declined to respond or to comment on other user suggestions. —*Robert Lauriston*

Alice LaPlante is a freelance writer in Palo Alto, California; Robert Lauriston is a contributing editor for PC World.

Novell: What Users Say

From PC World interviews

Overall satisfaction
Most users say that NetWare is the best network operating system around and that they're basically happy with it and Novell.

Cost of support
Many users think Novell should offer free telephone support to end users—particularly when their problems are caused byNetWare bugs.

Quality of support
Some who use phone support complain about being put on hold too long, or waiting days for Novell to call back. Others complain they can't get answers from their dealers or phone support. Many say CompuServe's NetWire forum is the best source of assistance, but others find it confusing and too hard to use.

Bug and fix notification
Users want to hear of bugs and fixes as soon as possible. One user suggests dedicating a specific topic in NetWire to this; another suggests that NetWare Users International coordinate the exchange of such information between user groups.

Upgrades
Most users think Novell charges too much for upgrades and should charge only 10 to 20 percent of list price.

Accessories
Some users say NetWare accessory programs (such as backup and print utilities) often are flawed. Many users resent having to buy third-party utilities for almost everything beyond the basic network operating system.

Users are generally comfortable with NetWare and Novell but want improvements in customer relations and purchase policies.

BRAD BOWER

TWO-FISTED MANAGEMENT

MARK MAREK

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there's something your desk.

a single CD, so you can have access to all kinds of data-intensive material like clip art and digital stereo sound.

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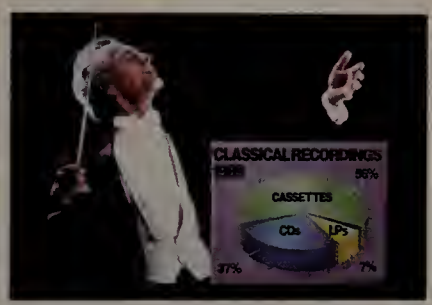

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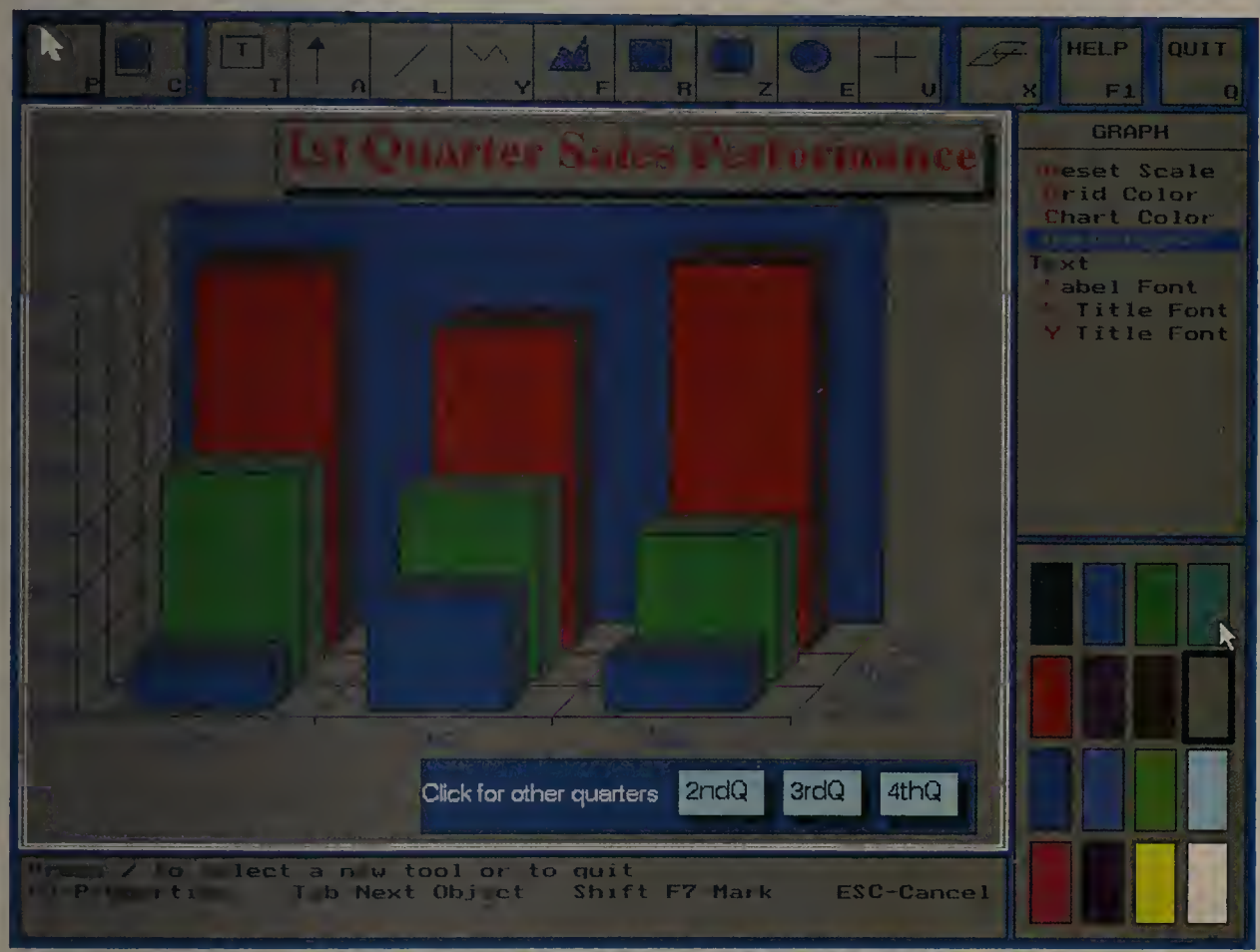
Circle 51 on reader service card

PREVIEW

PC WORLD OFFERS FIRST IMPRESSIONS OF PRERELEASE HARDWARE AND SOFTWARE

Quattro Pro 2.0, the Presentation Spreadsheet

More than just a spreadsheet, Quattro Pro 2.0 adds great features that rival presentation packages.



Quattro Pro 2.0 offers graphics tools that rival those of some stand-alone presentation packages. New features include 3-D graphs and the ability to insert hypertext buttons in a graph that will run a macro or jump to another graph.

John Walkenbach

Ask your friends to recommend a spreadsheet, and chances are they'll suggest Borland's *Quattro Pro.* Faster and easier to use than *1-2-3, Quattro Pro* has steadily chipped away at Lotus's share of the spreadsheet market. And with its superb macro facility, intelligent memory management, and advanced math functions, *Quattro* has won near-universal praise, including a *PC World* Best Buy (see "Seven Sensible Spreadsheets," April 1990).

But *Quattro Pro*'s biggest selling point has always been its business graphics, even though it's the only major spreadsheet that has not yet embraced a graphical user interface. Version 2.0 adds more sparkle with three-dimensional graphs, hypertext slide shows, and 35mm slide output. It also includes a goal-seeking command and a handy link to Borland's *Paradox 3.5* data manager.

Half Spreadsheet, Half Graphics

From the beginning, *Quattro Pro*'s business graphics have outshined the competition's. The key element is its graph annotate mode, which lets you augment a chart using drawing tools and clip art. Version 2.0 enhances the program's graphics prowess, making *Quattro Pro* a reasonable and inexpensive alternative to graphics packages such as *Harvard Graphics* and *Freelance Plus.*

The most important new feature is 35mm slide support. Output options were formerly limited to the PIC format; version 2.0 adds support for EPS and PCX formats, which can be used by service bureaus to create slides. *Quattro Pro* now imports CGM files in ad-

SNAPSHOT

Quattro Pro 2.0

The latest upgrode to this popular spreadsheet offers graphics features that compare well with those of leading presentotion grophics packoges.

KEY FEATURES

- **Exports graphics in EPS and PCX formats for 35mm slides**
- **Four new 3-D chart types**
- **Hypertext slide-show buttons**
- **Hot link to Paradox 3.5**
- **Goal-seeking function**

AVAILABILITY

Fourth quarter 1990

PRICING

$495 (includes ProShow Power Pack); for registered 1.0 users upgrade $79.95, ProShow Power Pack $39.95; for 1-2-3 owners Quattro Pro 2.0 $99.95, ProShow Power Pack $39.95

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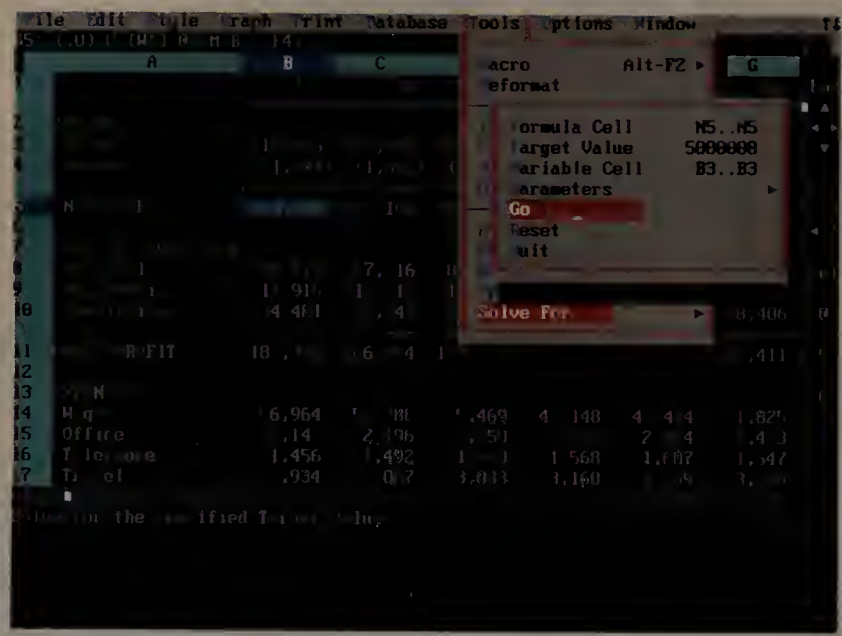

Quattro Pro 2.0 adds a helpful goal-seeking procedure. Called Solve For, the command lets you determine the value in a target cell needed to produce a desired result.

dition to the 30 clip-art files provided. You can copy images between presentations as well.

Version 2.0 offers four new layered 3-D graph types: bar, area, step, and ribbon charts. Unfortunately, you can't adjust their perspective or orientation; therefore, you may need to rearrange the data series so data plotted at the rear of a chart won't be obscured.

Also new is the ability to insert hypertext buttons in a graph, à la *Harvard Graphics 2.3*. You can place buttons anywhere on the screen and then attach a macro or graph name. When you click the button with a mouse, the macro executes or the graph displays. You can even hide the buttons behind graphic elements, so that clicking on a bar, for example, could display additional details. This feature is ideal for on-screen presentations, especially for customer-controlled sales demonstrations. With a bit of work, you could even use *Quattro Pro* for an attractive front end to a *Quattro* data base.

For extra graphics clout, Borland bundles a *ProShow Power Pack* option, which includes 100 additional clip-art files, two Bitstream headline fonts, a 60-page presentation tip book, and a $100 credit with a slide service. Current *Quattro Pro* users must add $39.95 to the $79.95 upgrade price to get *ProShow*.

Frequent business presenters will find *Quattro Pro* no substitute for the latest presentation packages (such as *Microsoft PowerPoint*) that offer presentation aids, aimed at speeding slide show creation. But Borland is close to the mark in claiming 80 percent of the functionality of most presentation packages.

Paradox Links and Goal Seeking

Like *1-2-3* release 3.*x*, *Quattro Pro* can query external data base files, including *dBASE* and *Paradox*. But for complex queries of large data bases, you'll want to exploit the new ability to run *Quattro Pro* from within *Paradox 3.5* and quickly toggle between them. You'll need at least 2MB of RAM to do so, however, since both products remain in memory and use a context-switching process.

While in *Paradox*, you can generate a query and dispatch the matching records directly to a *Quattro* worksheet for manipulation and charting. If you own *Paradox SQL Link*, you can even bring in data from SQL data base servers, mainframes, and minis—but you must issue the query from within *Paradox*.

Version 2.0 also boasts a handy new Solve For command, but don't let the name mislead you. It's nothing like *1-2-3/G*'s powerful Solver function. Rather, it's a goal-seeking procedure that determines the value of a single input cell that will yield a desired value in a dependent formula. For example, if you know January sales will be $50,000 and you project volume to increase steadily, you can set up the formulas and ask *Quattro Pro* what monthly percent increase will yield an annual sales level of $650,000. In previous versions you could get the same result, but you had to go through the tedious process of plugging in test values manually. Solve For gives you the answer in an instant.

Quattro is clearly a step ahead of its rivals with its Solve For function: *Excel* provides a macro that attempts to do the same thing, but it doesn't work as well. To get a similar goal-seeking feature in *1-2-3* release 3.1, you'll need an add-in. For more complex problems involving linear programming, *Quattro Pro* users can turn to the optimization feature, although it's less powerful than *1-2-3/G*'s Solver and far more difficult to use.

As in the previous version, you can select a graphics mode to display graphs and spreadsheet data on the same screen. And you can squeeze even more text onto the screen in text mode—version 2.0 now supports extended screen modes, including 132 characters by 60 rows, for most popular VGA adapters.

Another welcome improvement is an enhanced LaserJet driver that speeds *Quattro*'s rather slow printer output. It downloads up to eight Bitstream fonts and takes advantage of the printer's internal processing. (Unfortunately, there's still no background printing.) Network users also can save disk space by sharing font files.

Does It Stack Up?

Although superb graphics is its most obvious attribute, *Quattro Pro* continues to be a powerful spreadsheet with features that stand up well to the competition.

If your hardware isn't quite up to the standards required for running *Excel* or *1-2-3* release 3.1, you'll find that *Quattro Pro*'s VROOMM (virtual runtime object-oriented memory management) overlay technology can help you fit more data in the same amount of RAM. With VROOMM, you can load large files that would choke *1-2-3* release 2.2, even without *Allways* loaded.

Like *Excel*, *Quattro Pro* lets you work with multiple spreadsheets in resizable windows, and its pulldown menus are accessible by mouse or keyboard. *Quattro Pro* lacks the 3-D worksheets of *1-2-3* 3.*x*, but with its flexible file-linking commands, you'll hardly miss them. Version 2.0 is fully compatible with *1-2-3* release 2.2's files, including those with linked cell references. The optional *1-2-3* menu system remains, along with a special introductory offer for *1-2-3* users.

While most developers jump headfirst into graphical environments, *Quattro Pro* shows that a high-end spreadsheet can still run on low-end equipment. You give up a display that matches printed output, but you don't lose much in other areas, and you can still create top-notch business graphics.

John Walkenbach is a PC World *contributing editor.*

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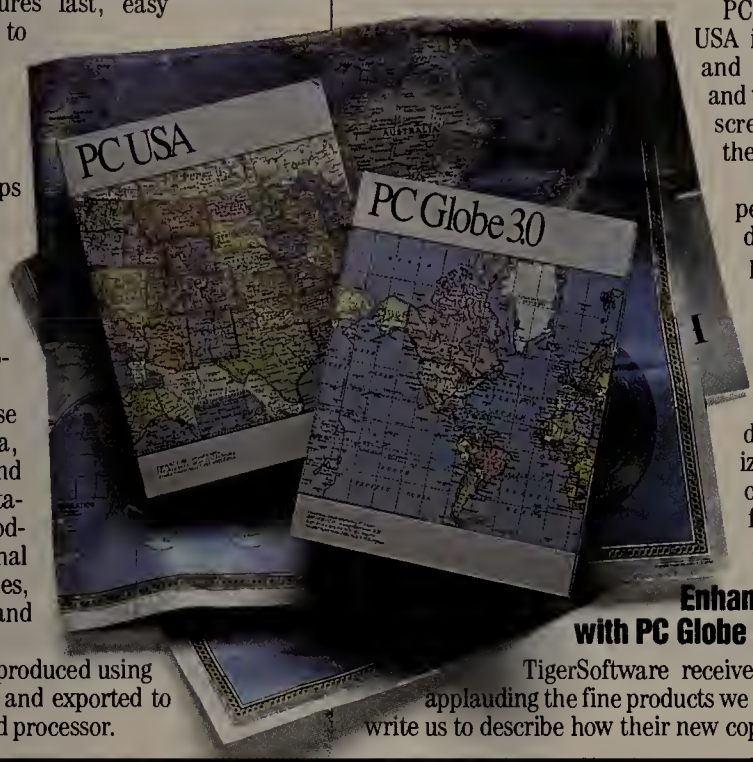

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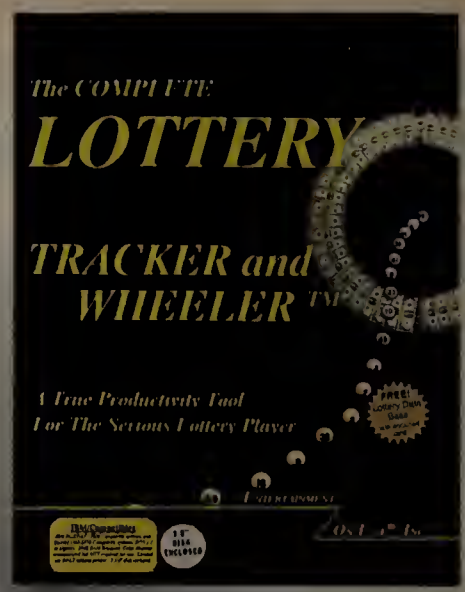
5

In Use Around the World.

"The Complete Lottery Tracker and Wheeler" is sold in all 50 U.S. states and 23 foreign countries. You can be confident that you are using a tested and accepted tool for "handicapping" (*tracking*) and wheeling lottery numbers.



"I hit 54 CASH PRIZES *the first 8 weeks with the help of your program! The Tracker and Wheeler* IS *the* BEST *lottery software program I have used overall... Over $2100.00 ahead after ALL expenses!*
— B.C., El Paso, Texas

Lottery Tracker And Wheeler Features:

- **Record** hundreds of past winning lottery numbers and dates.
- **Track** as many state and international lottery games as you want — no limit!
- **Chart.** Produce expert trend charts to identify those HOT and DUE numbers!
- **Produce Statistics** for all numbers you play — no randomizing here!
- **Select Numbers** to play 5 different ways! You choose what YOU like best!
- **Analyze** "hits" four ways: *bell curves,* to display overall tracks; *recency,* to identify numbers that hit within certain periods of time; *percentages,* offering probability tables for numbers; and *frequencies,* to indicate how often certain numbers hit.
- **Check Your Bets** for *winning* combinations! Records *all* systems played including BONUS NUMBER.
- **Print** charts, statistics, recorded numbers and wheeling systems!

BONUS!
Coupon for a FREE database of your state's past winning numbers!

ENTERTAINMENT-ON-LINE®, INC.

FY 6200 **Lottery Tracker & Wheeler** 5¼″ . $39.95
FY 6205 **Lottery Tracker & Wheeler** 3½″ . $39.95
IBM PC, XT, AT, PS/2 and compatibles. Requires 256K.

A Powerful Program To Manage All of Your Personal Information!

Collect Notes, Tasks, Schedules, Names, Addresses, Phone Numbers & Have Them At Your Fingertips!

Today in business and at home, there are so many important details you need to remember that having to depend on your own memory has become impossible.

Enter Instant Recall, the personal information program that manages all your personal information right on your PC. Instant Recall helps you get things done by tying together all your tasks, deadlines, meetings, phone numbers, suggestions, reports, and lists. Now, you never have to worry where you put that piece of information you were looking for. Instant Recall is so dependable, it's like having a personal secretary inside your PC.

Designed for Maximum Efficiency.

Since Instant Recall can be run as a memory-resident program, it's always available. With the touch of a button, Instant Recall pops up over any other software you're using, requiring only 28K in resident mode. In an instant, you can bring up loads of information to help you in whatever you're doing. And with the special clipboard, you can move information into and out of your other applications.

With Instant Recall's Note format, you can enter freeform text like ideas, memos, lists, reports, and key facts. Use the Task format for tracking and delegating assignments with priorities, target dates, and advance notice. Manage your time with the Schedule format, which includes conflict checking, week-at-a-glance, periodic events, and an open time display. Lastly, the People format is perfect for names, addresses, phone numbers, notes, follow-up dates. It includes an autodialer and allows you to address copy to a word processor, so you never have to type a name and address again.

An Integrated Solution.

Instant Recall goes one further by giving you integrated views that make connections for you, speeding your work. You can pull together your notes, tasks, schedules, names, and addresses on a single screen by topic, date, person assigned, priority or embedded text. This replaces your desktop organizer and text database software with a powerful integrated solution — making connections between pieces of information, giving you multiple perspectives, creating timelines from dates you've entered piecemeal. So Instant Recall actually shoulders much of the work for you.

Instant Recall is easy to use and easy to learn. Among its user-friendly features are pull down menus, mouse support, help screens, date and time stamps, a clipboard for exchange of information with other applications and import and export capabilities. It's compatible with all popular word processors and spreadsheets and has conversion utilities for Sidekick, Tornado, Memory-Mate, and delimited ASCII files. It's powerful, too, allowing up to 65,000 characters (over 30 pages) of text per entry and schedules for 64 individuals and 16 groups possible.

Instant Recall has received rave reviews in the industry press. In a recent *InfoWorld* comparative review, Instant Recall was rated tops in its category, garnering their coveted "Best In Class" and "Excellent Value" Awards.

With so much to offer anyone who needs to get organized, Instant Recall is *the* personal information manager. Say goodbye to the paper chase and hello to Instant Recall.

- Freeform data entry.
- Memos, ideas, lists, reminders and more.
- Organizes all of your personal information.
- A personal manager on a disk!
- Nothing faster or easier!

CHRONOLOGIC

FY 2710 **Instant Recall** 5¼″ & 3½″ **$99.95**
IBM PC, XT, AT, PS/2 or compatible with 512K RAM (28K in resident mode), DOS 2.1 or higher (resident mode requires hard disk and DOS 3.0 or higher); autodialer supports Hayes or compatible modem, Microsoft, Logitec, or compatible mouse.

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International Orders: (305) 443-8212

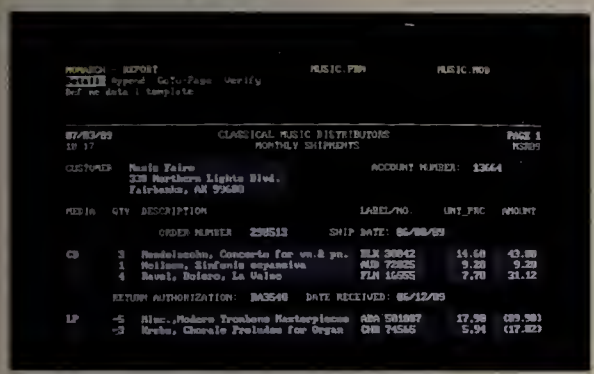
Circle 259 on reader service card

Now You Can Download Reports From Any Mini or Mainframe and Bring the Data Alive on Your PC!

Turns a Report File into a Ready-Made Database.

Consider for a moment the vast ocean of information that governments, corporations and other organizations around the world accumulate, store and manage. Every day, billions of bytes of new information are added to the pool. If handled with thoughtful care, this information can be a priceless resource.

The sheer volume of information demands a mainframe or mini-computer for data storage. But here's the paradox: All the best tools for data analysis are on the PC. PC users who need to get their hands on the data cannot gain access to it. They must sift through stacks of printed reports to find what they want. Now, for the first time, there's a remarkably intuitive new tool to help PC users bridge the data gap.



Monarch reads report files and extracts the data. Here, the extraction template overlays the report.

Existing Reports Become Valuable, Ready-Made Databases.

Monarch reads computer-generated reports and extracts the data! To understand the magic of Monarch, picture all the reports that come across your desk. All those cost summaries, transaction reports, customer lists, asset schedules, payroll reports and more. Think of flipping through all those pages trying to understand what's going on. Imaging trying to rekey all that data into your spreadsheet for analysis. With Monarch, the data comes alive.

Monarch can read any report downloaded from a mainframe or mini-computer. (Or generated on a PC.) It extracts data from the report file and serves it up any way you want. You can see it, sift it, select it, summarize it and send it out to your spreadsheet, word processor, graphics package or database manager. Monarch can read any report stored on disk, including ASCII files, TXT files, PRN files and SDF files.

CASE STUDY: The Agony of Printed Reports...

Suppose you've got a 500-page customer activity report that's been downloaded from your company's mainframe. You've been asked to analyze sales trends, but you don't want to spend hours digging through the printed report. Monarch allows you to automate the analysis by turning the report into a live database.

Here's how it's done. Simply load the customer report file into Monarch, quickly define a data extraction template, and then explore the report using powerful data analysis commands.

You can tell Monarch to show you all the sales transactions for a particular customer, product, salesman or region. Then produce crosstab summaries that show the field totals and record counts broken out in a variety of useful formats. Data and reports can be output on a printer, or exported to applications like Lotus 1-2-3.

personics

FY 1002 **Monarch** 5¼″ & 3½″ **$495.00**
IBM PC, XT, AT, PS/2 and compatibles with 512K. Hard disk recommended.

Expand Your Power and Control Over Lotus 1-2-3 Macros!

Go Inside and Diagnose Any 1-2-3 Macro Error!

Many PC users all over the world have come to realize the power of Lotus 1-2-3. Not only is it a great spreadsheet program, its macros make it a powerful computing language unto itself. Anyone who knows 1-2-3 quickly realizes you don't know 1-2-3 until you know how to do macros. 1-2-3 macros let you automate a whole range of tasks that save time and energy. They make Lotus 1-2-3 the revolutionary program it is.

But 1-2-3 macros, like any programming language, have their special characteristics that turn little syntax errors into monstrous problems. Everyone who uses 1-2-3 macros undoubtedly knows the frustrating ERROR message that inevitably crops up when you're trying to run a new macro. Even the best 1-2-3 macro developers run into snags when putting together a macro.

The Macro Solution.

Until now, the only answer for those frustrating situations has been invoking the 1-2-3 STEP mode. You start at the beginning and poke along until an error message pops up on the screen. After you've figured out what's wrong, you go back to the beginning and start all over again. To make matters worse, if your macro contains the [WINDOWSOFF] and [PANELOFF] commands, you're sailing in the dark. There's nothing more frustrating than trying to get a job done with a macro you can't get to work and having no help with it. On routine 1-2-3 questions, you can ask whoever is around for help or call technical support. With macros, you either find an expert or you can just give up.

Now, there's a better way — the Personics Macro Editor/Debugger (MED), an enormously powerful, truly interactive, and genuinely easy-to-use tool for developing, debugging, and maintaining 1-2-3 macros. As soon as you find a problem with one of your macros, just pop up the MED debugger window and quickly find out what you need to change. The Personics Macro Editor/Debugger will become your private technical support line, immediately available whenever you need it.

No Need To Be Frustrated Any Longer.

You'll be amazed at how much more productive you'll be with MED in your tool kit. When an error condition is identified in MED's debugger window, you can jump to the editor window, quickly make a change, then resume execution where you left off. And MED's expanded error messages give you the information you need to understand why your macro errors have occurred. Each error message is also described in depth in MED's detailed handbook. From now on, if you have a problem with a macro, you know where to turn.

With the Personics Macro Editor/Debugger, you won't dread attempting long 1-2-3 macros because you're afraid they won't work. You can track down even the most elusive macro problems simply and easily and then know how to fix them. You can start macro execution anywhere and follow along at a choice of speeds or set watchpoints to monitor important variables. With MED, you can set breakpoints to halt execution when a user-defined condition is met. Each of the Personics Macro Editor/Debugger's features are designed to make developing and debugging your macro jobs as easy as possible.

Fast, Effective, and In-Depth.

Sometimes, you have to play doctor with a software package like Lotus 1-2-3 to get the most out of it. Should I have done this in my macro? Or should I have done that? Sometimes, being the best doctor isn't enough to diagnose the problem with a complicated macro. That's when MED comes in.

The Personics Macro Editor/Debugger is receiving wide praise for its effective way to shortcut 1-2-3 macro errors. "No serious macro developer should be without this tool," says noted macro expert Scott Tucker. The Personics Macro Editor/Debugger — your complete diagnostic kit for 1-2-3 macros.

personics

FY 2830 **Macro Editor/Debugger**
5¼″ & 3½″ **$199.95**
IBM PC, XT, AT, PS/2 & compatibles; works with 1-2-3 Release 2.0, 2.01 and 2.2 and uses approximately 65K of RAM. If you are using 1-2-3 Release 2.0 or 2.01 and MED is your only add-in; you'll need approximately 20K of RAM for the 1-2-3 Add-In Manager.

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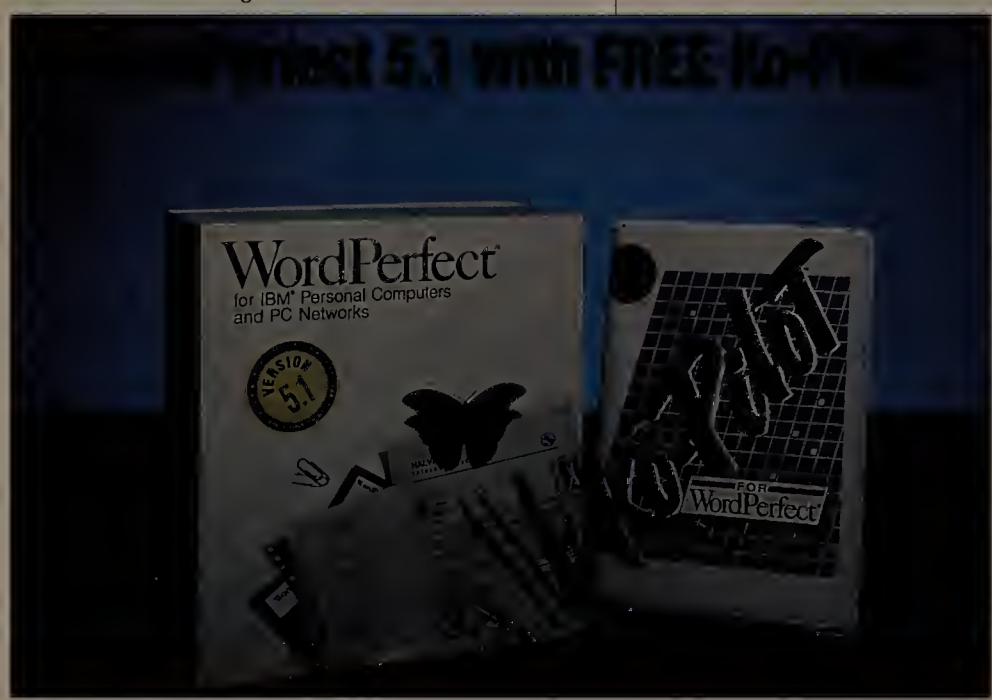
International Orders: (305) 443-8212

Circle 259 on reader service card

Isn't It About Time You Used the Finest Word Processing Software in the World?

Includes FREE Ko-Pilot and RightWriter 4.0

There's only one way we could think of to improve WordPerfect 5.1 — and that is to include RightWriter and Ko-Pilot — so we did! We call it "The WordPerfect Writer's Pack," everything you need to create magnificent documents, check them for errors in grammar, style, word usage and punctuation — even use existing documents created on other word processors. That's over $200 of award-winning software FREE!



WordPerfect is considered the standard in word processing software for the business environment (with its advanced network support), and this brand new version has been streamlined even further, making it faster and simpler to use. Now users of any expertise level can fully enjoy the amazing functionality of WordPerfect.

What's New in Version 5.1?

For starters, WordPerfect 5.1 features the most elegant pull-down menu system we've seen in word processing. It is so well designed, it glides the user through any task, and makes every document you create clean and professional. You'll love the new features for quickly setting up columns and rows, and the ability to adjust your text in seconds when making revisions, wrap text in-column, around graphics, charts or call-outs. No other system allows so much flexibility — all without the usual plethora of cryptic commands.

Speller, Thesaurus & Dictionary Hyphenation.

A 115,000-word spell check dictionary quickly detects errors in spelling, typographical errors, double words and aids in hyphenation. And Version 5.1's Speller and hyphenation dictionary have been combined into one file, requiring less disk space.

FREE Ko-Pilot!
with the Purchase of WordPerfect

Throw Away Your WordPerfect Manual!

Don't sit at your PC frustrated with WordPerfect any longer. Now, Ko-Pilot gives you the power to use all of WordPerfect's functions, from the simplest to the most advanced, at the touch of a key. All you do is press F3 when you're not sure how to use a feature and Ko-Pilot takes over from there. With simple pull-down menus that tell you your options, you have instant access to the features you want without having to memorize the complicated key combinations. ***A $69.95 value.***

BONUS OFFER!

FREE!
RightWriter 4.0
with the Purchase of WordPerfect

The premier grammar, style and punctuation checker for the PC!

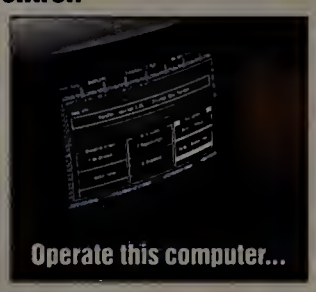
WordPerfect
CORPORATION

FY 8400 WordPerfect 5.1 with FREE Ko-Pilot and RightWriter
5¼" & 3½" **$355.26**
IBM PC, XT, AT, PS/2 & compatibles; minimum 384K.

The Fastest Remote Computing; Detailed System Status & Diagnostics.

CO/SESSION...
Operate Any Computer Anywhere in the World — By Remote Control!

CO/SESSION allows you to quickly connect your computer to a distant PC (on a phone line) and run that remote computer as if you were right there — at the keyboard! From a laptop in a hotel room, you can control your PC back at the office — even if it's more powerful — provide training, or troubleshoot a customer's system from your office.


Operate this computer...

...using CO/SESSION...

...from anywhere!

You can even print documents on either, or both systems simultaneously. And Co/Session 4.0 includes an all new *"windows-like"* interface for speed and convenience, plus error-checking, seven advanced new security features, EGA, VGA and Hercules support (for graphics) and much more.

Easy to Use.

The best package available for *remote computing, remote customer support, background file transfers and remote network access.* Easy to use — just install it — Co/Session sits in the background using only **51K**. Use hot keys to quickly call up Co/Session on either the host or remote PC.

Advanced Security.

Co/Session protects your data with features like: dual-passwords, password-checking and data encryption. You can restrict the ability to send or receive files on the remote PC, blank the other computer's screen — even disable its keyboard to prevent unauthorized access.

Fastest Remote Software Available.

Co/Session transfers files up to 20% faster — updates screens up to 400% faster than competitors! In fact, Co/Session was proclaimed "Fastest Remote Software Package" by *InfoWorld* in March, 1989!

And Co/Session is fully compatible with all leading software like Lotus, WordStar, WordPerfect, dBASE IV, and SideKick.

SYSTEM SLEUTH...
Discover Hidden Configuration Details inside Your PC!

System Sleuth is an easy-to-use, advanced "passive diagnostic" system that probes deep into the heart of your PC, illuminating secrets (and pitfalls) — without damaging your precious data. Extensive helps screens aid in understanding how your computer works — and why it won't! System Sleuth also gives you the information necessary to make smart configuration decisions when adding new hardware and software — maximizing its performance — and avoiding conflicts.

In addition, System Sleuth helps you avoid needless repair bills and provides details that can be helpful when obtaining technical support from hardware and software manufacturers — your system status is displayed right on the screen.

You'll have instant access to information on processor and card types, BIOS date, DOS version, ports used and memory installed, including a complete rundown of what's contained in each 64-KBtye segment up to 1 MByte. Display TSRs loaded, their functions and memory allocation, interrupt vector tables, device drivers loaded (and attributes) and disk information (including bad tracks).

Also Available, WinSleuth for Windows

An all new version of System Sleuth for Windows 3 protected environment. The familiar reporting features of System Sleuth are available as well as many new analysis tools for Microsoft.

TIGER EXCLUSIVE OFFER
SYSTEM SLEUTH FREE WHEN YOU BUY CO/SESSION

TRITON

FY 3800 Co/Session & FREE System Sleuth
5¼" & 3½" **$229.00**
FY 3830 Session/XL 5¼" & 3½" **$95.00**
FY 1060 System Sleuth 5¼" & 3½" **$99.00**
FY 1065 WinSleuth 5¼" & 3½" **$99.00**
IBM PC, XT, AT, PS/2, compatibles with 256K (host PC requires 50K).

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The Personal Weather Forecaster... Instant, Up-To-The-Minute Meteorological Information.

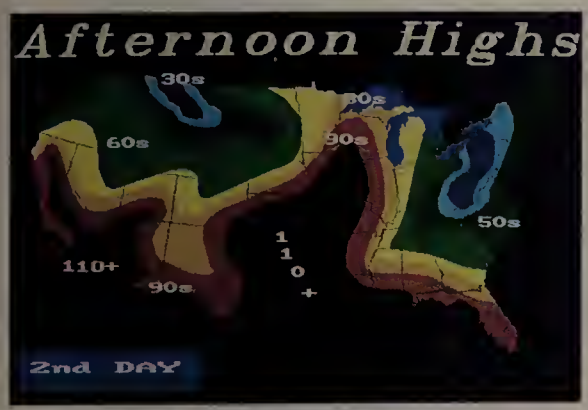
Connect to the Same Weather Database Used by Radio & TV!

Should you plan the company outing for this Saturday? Wondering about the forecast for a business or vacation destination? With WeatherBrief, your PC becomes a personal meteorological center, allowing access to the WeatherBank information service. Via modem, you'll receive up-to-the-minute forecasts for any region or the country or the world — in just a few seconds! In fact, this is the same service used by radio and television stations. The maps that appear on your screen are the very same images downloaded to television control rooms and broadcast on the air. Weather professionals depend on the precise, timely meteorological information provided by WeatherBank — now you can, too.

The detailed, color-enhanced maps display current precipitation, temperature, cloud cover, storms, lightning, hurricane tracks, jet stream movement, freezing levels, soil temperatures and radar-gathered information. The fast, menu-driven operation provides information for family use, business travelers, travel agents, pilots and others. Switch between maps for a complete picture of the current weather conditions anywhere.

As Much Detail As You Want!

What's the weather like in Paris, Tokyo, Rome, Sydney, Moscow, Frankfurt or Madrid? A menu selection displays complete information in seconds. Need highway reports, marine or aviation conditions? WeatherBrief provides fast, accurate forecasts including freezing levels and off-shore data. WeatherBrief also includes agricultural outlooks and extensive climate statistics (such as rainfall, average temperatures, etc.) for any region.



Up-to-the-minute maps with information on temperature, precipitation...

...Jet stream, freezing levels and more!

THE SOFTWARE TOOLWORKS

FY 1009 **WeatherBrief** 5¼″ & 3½″ **$99.95**
IBM PC, XT, AT. Requires modem.

Quickly Convert Files Between Word Processor Formats!

Use All Existing Files with Different Word Processors.

Now those indispensible word processing files you created six months ago can be easily converted to the format you're running now. WORD FOR WORD is ideal for exchanging files of different formats with business associates, customers, friends — you can even convert files created on your home or laptop computer to the format used in your office — with all of the formatting commands (like bold, underline, centering, tabs, etc.) intact!

WORD FOR WORD is the fastest! It can convert a 25-page document in less than one minute — 600% faster than the competition!

Allows Lotus 1-2-3 Conversion INTO Your Word Processor!

WORD FOR WORD allows you to import spreadsheet data into your word processing format! And no other product allows you to perform conversion between "integrated" packages like Enable, Framework, Q&A and pfs: First Choice.

Supports Navy DIF, Peachtext and Enable, RapidFile and WANG PC.

Converts ALL Attributes!

...contained in the original: margins, tabs, indents, soft and hard carriage returns, boldface, italics, underlines, superscripts/subscripts, newspaper columns, headers, footers, centering, footnote formats, ruler lines, page ends — and more!

Protect Your Investment!

WORD FOR WORD is a powerful, yet flexible file conversion utility that enables you to protect prior investments in document files. It saves the time of re-inputting and extensive re-editing when the need arises to either convert or to communicate with another word processor software program.

Batch Processing Ability.

Converts up to 200 files in a single session. Supports DOS Wildcard conventions and full directory pathing.

Convert in Either Direction Between Any of These Formats:

- ASCII (smart, stripped*)
- Displaywrite 3, 4 (DCA/RFT)
- EBCIDIC
- Enable 1.1, 2.0, 2.15
- Framework III 1.0, 1.1
- HP AdvanceWrite Plus
- IBM Writing Asst. Plus
- Lotus 1-2-3 1A, 2.0
- Lotus Manuscript 2.0, 2.1
- Microsoft Word 3.0, 3.1, 4.0, 5.0
- Microsoft RTF
- MultiMate 3.3
- Multimate Advantage I &II
- Navy DIF
- OfficeWriter 4.0, 5.0, 6.0, 6.1
- PeachText 5000
- pfs: First Choice 1.0, 2.0
- pfs: Write (version C)
- Professional Write 1.0, 2.0, 2.1
- Q&A Write 3.0
- RapidFile (Memo Writer) 1.2
- Samna Word IV 1.0, 2.0
- Samna Word IV Plus 1.2, 2.0
- Volkswriter Deluxe 2.2
- Volkswriter 3, 1.0
- Volkswriter 4
- WANG PC 3.0
- WordPerfect 3.0, 4.1, 4.2, 5.0
- WordStar 3.3, 3.45, 4.0, 5.0, 5.5
- XyWrite III, III Plus

New Formats Added:

- Excel – The ability to convert MicroSoft Excel spreadsheet data to and from word processors (similar to our Lotus 1-2-3 conversions).
- DCA/FFT – The ability to convert Displaywrite final form text both to and from.
- Total Word – From Volkswriter

Upgraded Support:

- Multimate 4.0
- Rapidfile 2.0
- WordStar 6.0
- WordPerfect 5.1

**The new "stripped" ASCII is designed for the needs of typesetters and desktop publishers. It contains less formatting recognition than standard ASCII.*

THE SOFTWARE TOOLWORKS

FY 1320 **Word For Word** 5¼″ & 3½″ **$99.00**
IBM PC, XT, AT and compatibles with 256K RAM.

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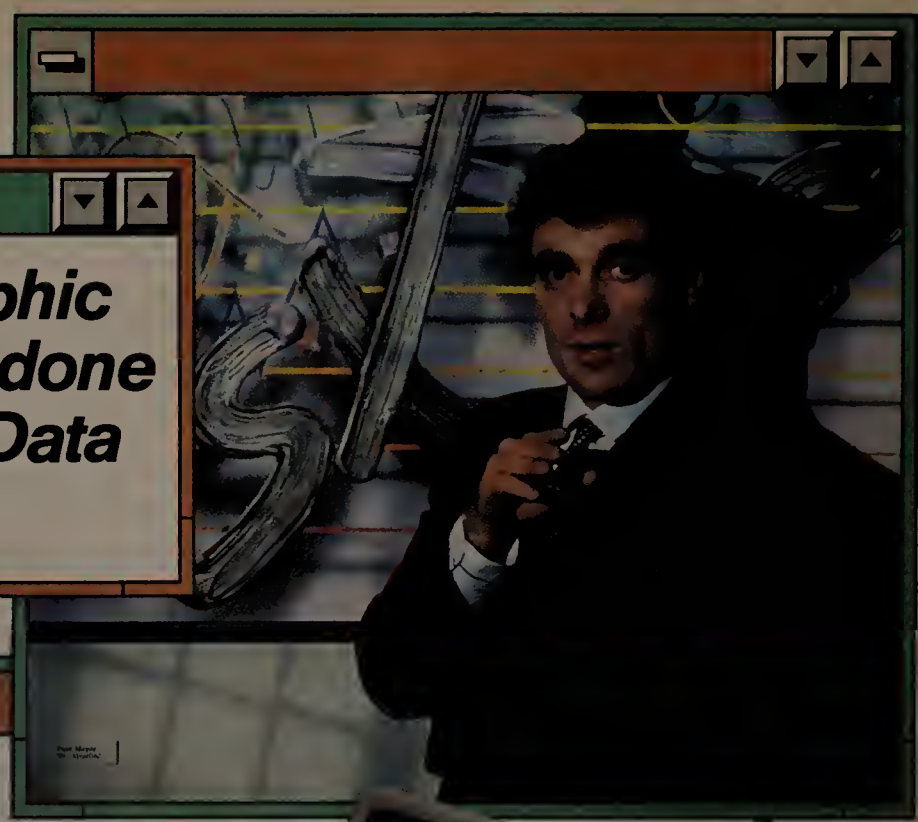

"I was looking for a graphic example of what could be done with a laptop PC...Zenith Data Systems showed me two."

ZENITH DATA SYSTEMS INNOVATES AGAIN™

SupersPort 286e

SupersPort SX

The number one laptop brand in America* offers you the clear choice in portable VGA graphics.

Zenith Data Systems brings you *two* advanced laptop PCs that can run today's sophisticated color VGA applications, using 16 corresponding shades of gray for superior graphics presentations.

First, there's the number-crunching SupersPort® 286e with its dazzling backlit LCD display. Then there's the SupersPort SX with a *Page White* screen that virtually duplicates the printed page...plus Intel386SX™ power to handle tomorrow's graphical user interfaces.

And each features our *Intelligent Power Management™ System,* which puts power usage in *your* control for hours of battery life.

So, if you want to carry away the clear choice in portable VGA graphics, see our leading VGA-enhanced SupersPort laptops in action. For more information and the name of your nearest Zenith Data Systems Medallion Reseller, call: *1-800-523-9393.*

ZENITH
data systems
Groupe Bull

*Source: 1990 Dataquest estimate for U.S. battery-powered laptops. Graphics simulate Microsoft® *Windows™ version 3.0,* a product of Microsoft Corporation. Intel386SX is a trademark of Intel Corporation. SupersPort is a registered trademark and Intelligent Power Management is a trademark of Zenith Data Systems Corporation.

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Circle 290 on reader service card

SX Notebooks Hit 20 MHz

Compaq's LTE 386s/20 boasts a memory cache and a generous capacity for RAM, but TI's TravelMate 3000 is 2 pounds lighter and (probably) $600 cheaper.

Compaq's 8.5-pound LTE 386s/20 runs at 20 MHz, boasts a VGA display, and comes with a built-in 4K memory cache.

KIRK AMYX

Michael Goodwin

When the train's ready, everyone jumps on board: As soon as technology can support a new user benefit, manufacturers rush to deliver it. Thanks to a new generation of low-power disk drives, VGA displays, and CPUs, several lightweight 20-MHz 386SX notebooks are coming down the track. In fact, Compaq and Texas Instruments are running their 20-MHz trains on a collision course.

These lean little locomotives are both based on successful models: the LTE 386s/20 from Compaq looks very much like the company's best-selling LTE and LTE/286 except for its big, new VGA screen. TI's TravelMate 3000 is a slightly thicker version of its Best Buy TravelMate 2000—the lightest, most portable hard disk notebook on the market today.

Both 20-MHz notebooks come with 2MB of standard RAM, a 60MB hard disk (smaller drives are available), a built-in floppy drive, and a PS/2 mouse port. (TI's 60MB model won't be available until January 1991.) Both machines offer an optional expansion unit. Both boast a big, bright, beautiful VGA display (although the TI has a super-VGA output port, while the Compaq doesn't). And both promise 3 hours of battery life. If past performance is any indication, however, Compaq's battery will probably deliver at least 5 hours.

The critical differences, then, are weight, memory, keyboard, and price—and your choices here are quite significant.

Weighty Matters

When it comes to traveling weight—including the notebook itself, battery, AC charger, and power cables—TI's 6.8-pound TravelMate 3000 scores an easy victory over Compaq's LTE 386s/20, which weighs almost 2 pounds more. Despite the difference in weight, however, the two notebooks are almost identical in size and shape at 8.5 by 11 by 1.8 (or 1.9) inches.

In a world where powerful graphics applications are demanding heftier helpings of RAM, memory capacity will have a real impact on what kind of work you can do on the road—and how easily you can do it. With a 10MB ceiling for memory, the LTE 386s/20 will let you run *Windows* plus a bunch of memory-hog applications without a second thought. And while the TravelMate 3000's 6MB ceiling is anything but shabby, it might seem cramped sooner than you expect.

Unless your laptop is the *only* computer you ever use, you'll want a keyboard that's as close to standard as possible. Your fingers will find the TravelMate 3000's dedicated cursor keys in the familiar inverted T; the LTE 386s/20's nonstandard arrangement takes more getting used to. Neither computer provides dedicated <Page Up> and <Page Down> keys. New firmware from Compaq should correct the problem of unreliable key contact that some LTE users report.

Cost comparisons fall out as you might expect given Compaq's reputation for premium pricing: As we go to press, TI's $6399 baby (with the 60MB hard disk) is $600 less expensive than Compaq's $6999 60MB notebook. TI also offers 20MB and 40MB models, and you can choose a 30MB Compaq unit if you prefer.

Honed for the High End

Both Compaq and TI are aiming at users with money to spend: consultants, executives, and businesspeople whose

SNAPSHOT

Compaq LTE 386s/20

Compaq's 8.5-pound 20-MHz notebook gives you up to 10MB of CPU-speed RAM and will probably run for well over 3 hours.

KEY FEATURES

- **60MB hard disk and built-in floppy**
- **Square-pixel VGA display**
- **4K memory cache**

AVAILABILITY

Immediate

PRICING

$6999 for 60MB model

Compaq Computer Corp.
P.O. Box 692000
Houston, TX 77269-2000
800/231-0900

Reader service no. 810

SNAPSHOT

TravelMate 3000

The amazingly lightweight TM 3000 gives you a floppy drive, a 60MB hard disk, and 3 hours of battery life.

KEY FEATURES

- **6.8-pound traveling weight, including built-in floppy**
- **Cursor keys in standard inverted T**

AVAILABILITY

20MB and 40MB models immediate, 60MB model January 1991

PRICING

60MB model $6399 (estimated)

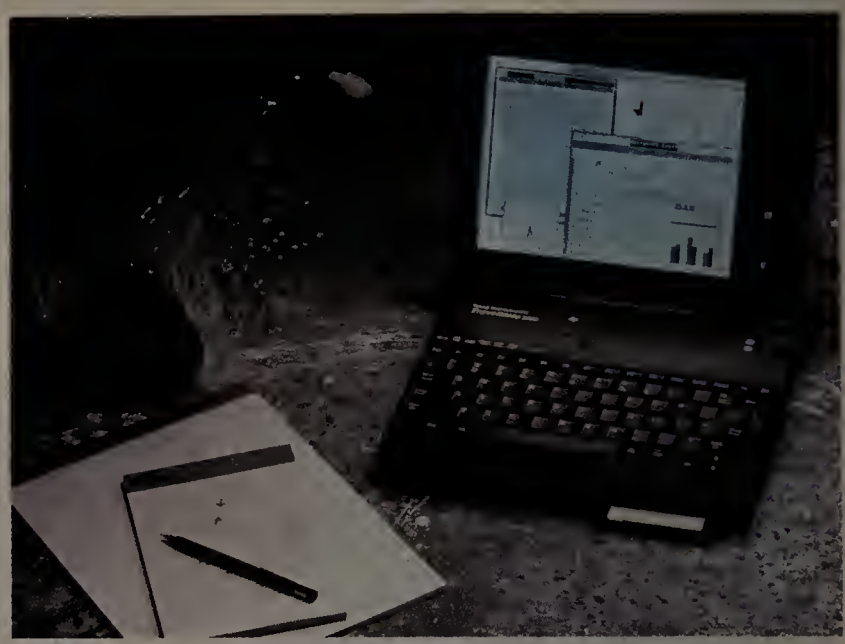
Texas Instruments Inc.
P.O. Box 202230
Austin, TX 78720-2230
800/527-3500

Reader service no. 811

companies have standardized on 386 desktops (and applications) and who need the same functionality on the road.

There's some crossover in the markets for these powerhouse notebooks and Compaq's SLT 386s/20. Since Compaq's LTE 386s/20 uses the same chip set as the SLT 386s/20, the two machines should race through the benchmarks at the same pace, but the similarity ends there. The SLT has a 120MB hard drive option, it lets you install up to 14MB of CPU-speed RAM, and its removable keyboard has a slightly better layout. On the other hand, its 18-pound traveling weight makes it more at home on a desk than in the hand of a frequent flier.

Even a quick comparison of the competing 20-MHz notebooks shows the TravelMate is 2 pounds lighter, $600 cheaper, and has a slightly slicker keyboard. The LTE offers a higher 10MB RAM ceiling and will probably run a few hours longer on its battery. And if you want a 60MB hard disk right now, the LTE is your only choice. We'll need to wait for performance testing to reveal how much difference Compaq's associative memory cache makes. But clearly, both of these trains will take you all the way home.



The featherweight (6.8-pound) TravelMate 3000 includes a floppy, a hard disk, and VGA graphics.

Michael Goodwin is an associate editor for PC World.

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V.32/V.42bis

X.32 (Dial X.25)

Since it was introduced four months ago, ULTRA 96 has become the fastest-selling Hayes modem ever.

Not only because the move to high-speed modems is in full swing, but because no other 9600 can deliver the features, performance, and networking capabilities of the fully loaded ULTRA 96.

ULTRA 96 provides up to 4-to-1 data compression, so it can save you money by letting you run computer equipment at its maximum speed.

In fact, you'll save so much on long-distance charges, your ULTRA 96 will pay for itself in just a few months. And its unique X.32 (Dial X.25) capability allows users to take advantage of the lower costs associated with the use of national and global packet-switched networks.

Of course, ULTRA™ works just as well on leased lines, satellite links, and other networks. It even automatically negotiates the best connection with other modems. Hayes or otherwise.

Plus, it uses the world standards for error-control and data compression, V.42 and V.42bis, and it can downshift to MNP® levels 2 through 5.

What's more, ULTRA 96 is compatible with the most popular high-speed modem on the market. The Hayes V-series® Smartmodem 9600.™

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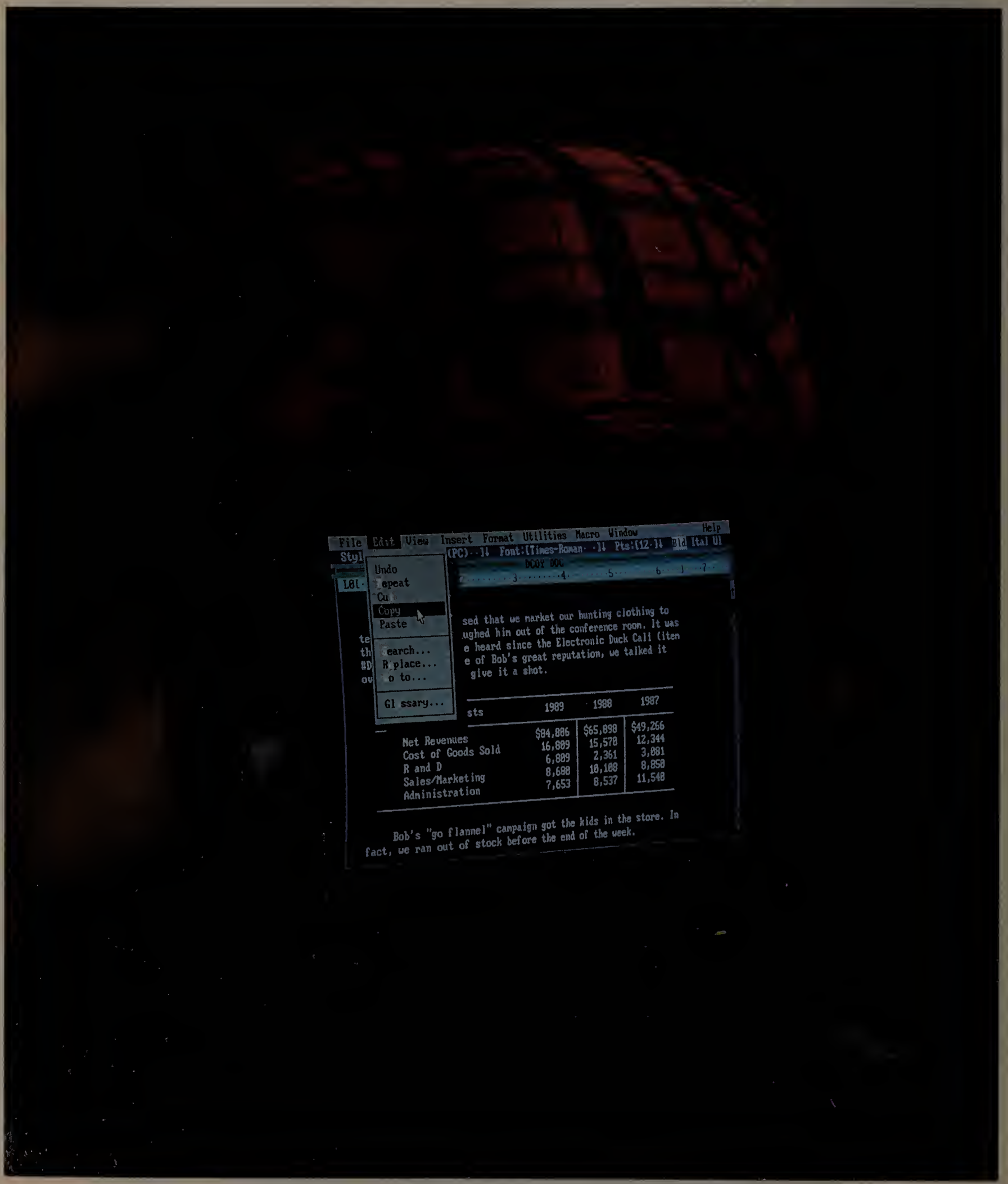
Hunting se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ughed him out of the conference room. It was
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give it a shot.
1989 1988 1987
Net Revenues $84,886 $65,898 $49,266
Cost of Goods Sold 16,889 15,578 12,344
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Administration 7,653 8,537 11,548
Bob's "go flannel" campaign got the kids in the store. In
fact, we ran out of stock before the end of the week.

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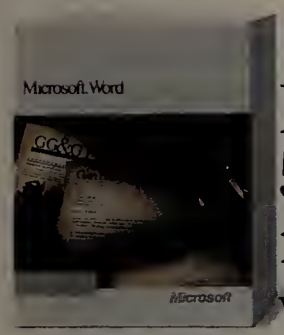


We created new Microsoft® Word version 5.5 with a certain aim in mind: make powerful word processing features easier for you to find and use.

Which is why we've outfitted it with a new interface that's both intuitive and visual.

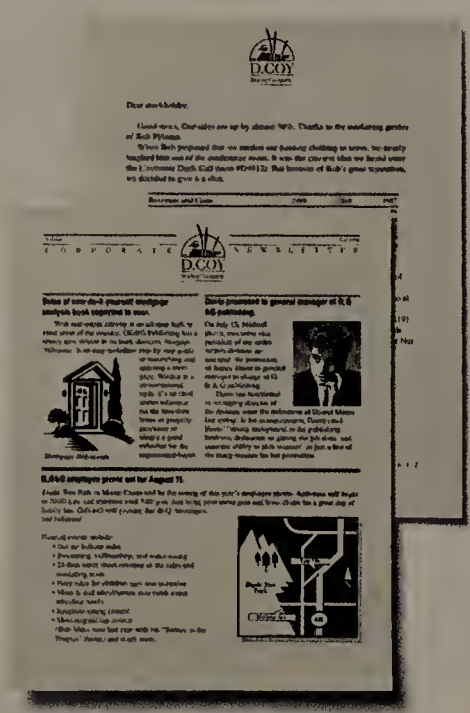
Smartly designed pull-down menus and dialog boxes now allow you to quickly access Word's familiar powerful features. Like dynamic tabs, programmable macros, outlining and styles. Then, to make everyone more productive, there are annotation and group document management features.

But not only can you bag more features, you can also insert graphics from other applications, and preview your text on-screen before printing it out. Nothing is hidden from you.

We've even added a handy new feature, called the ribbon.

It will make tracking and applying your formats, font, and font sizes a breeze. So your documents will always hit the mark.

Of course, if you do happen to venture into unfamiliar territory, online help can lead you out of the woods. Automatically.



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And you can do it all with a point and click.

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For more information on just how simple it is to use our new Word, give us a call at (800) 541-1261, Dept. M88.

Our new ribbon lets you tie together anything from fonts to styles to formatting. And all it takes is just a point and click with the mouse.

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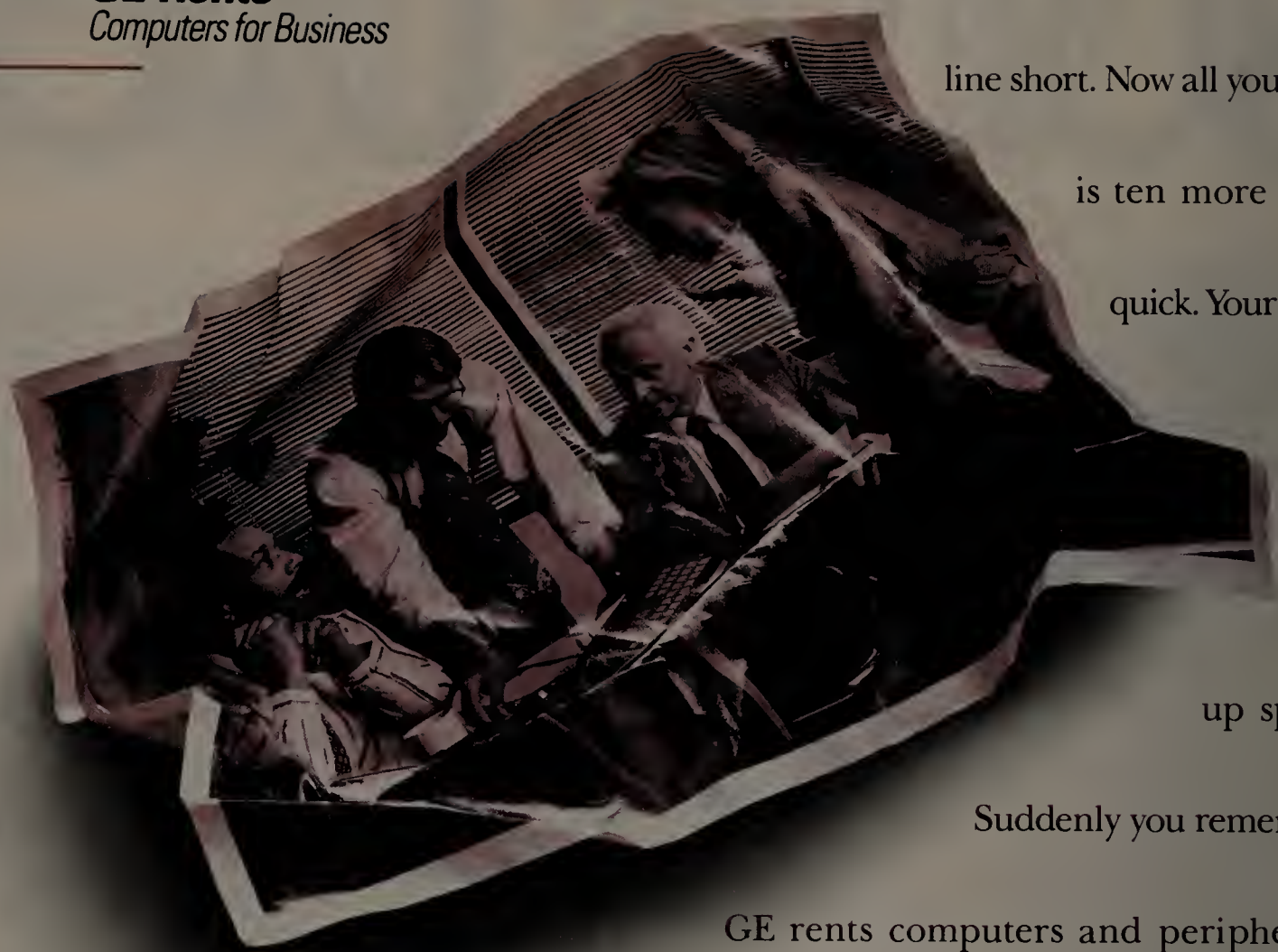

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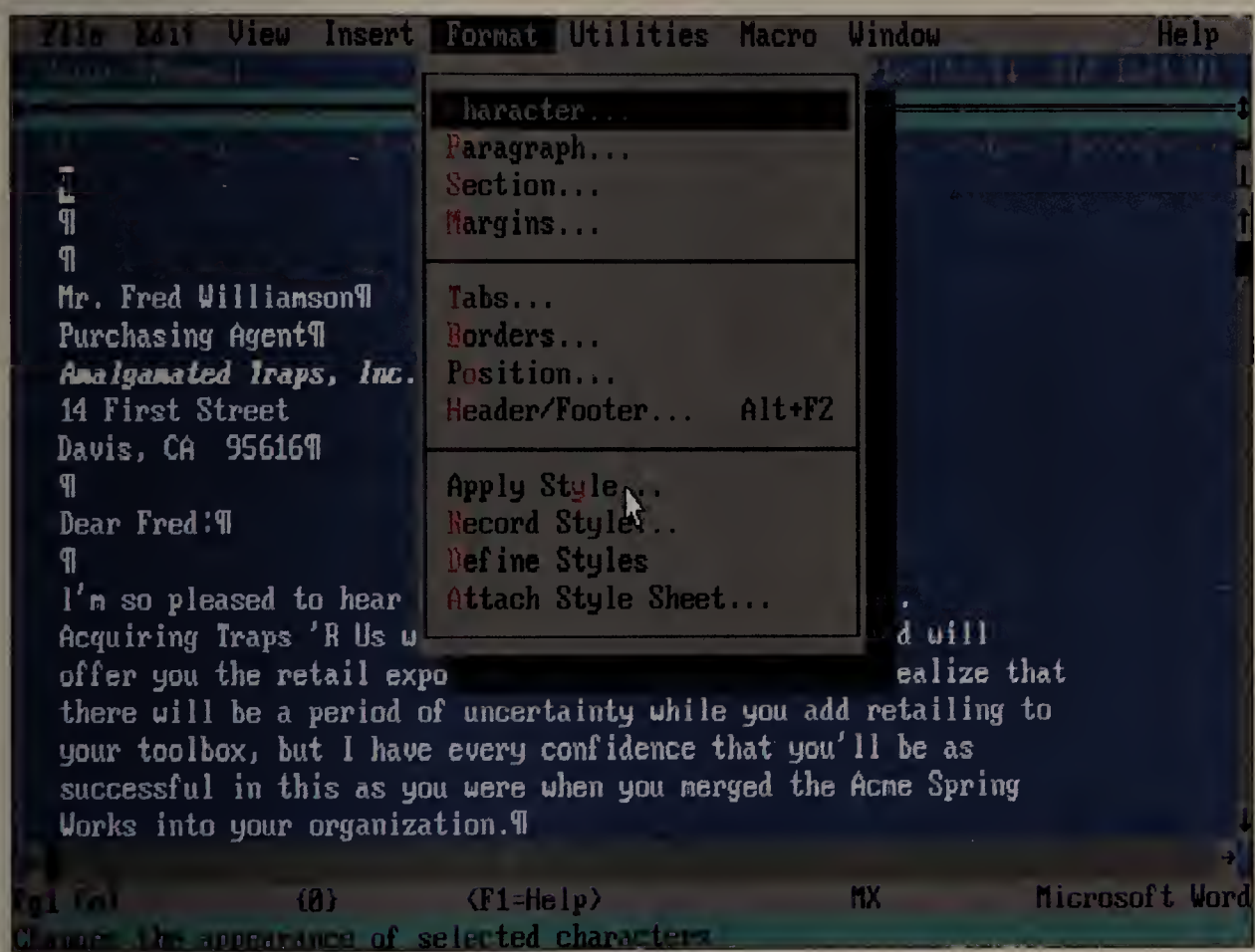
Word 5.5's Big Risk: A Top-to-Bottom Make-Over

Microsoft one-ups WordPerfect's pulldown menus with a total redesign of the classic Word. Is Word 5.5 a breakthrough or another "new Coke"?



Revamped with pulldown menus, dialog boxes, and a top-line ribbon bar, Word 5.5 borrows several tricks from Word for Windows.

George Campbell

What's a loyal *Microsoft Word* user to think? First, Microsoft reinvents the *Word* wheel with *Word for Windows.* Now it takes an ax to the bottom-line menus of the character-based *Word. Microsoft Word 5.5* offers a completely new look, with *Windows*-like pulldown menus and dialog boxes. It resembles a character-based *Word for Windows.*

The upgrade is only $50, but will *Word* users be willing to learn a new interface? And what was wrong with the old menus anyway? Fortunately, those who don't like the new look can opt to install *5.5* with the old menus.

Impassioned arguments with *WordPerfect* partisans aside, most *Word* users would admit amongst themselves that *5.0*'s interface is a rather awkward, Byzantine affair. The qualities that made *Word* users loyal were the powerful, elegantly implemented features and the sound underlying philosophy of "select, then format."

The good news is that *Word 5.5*'s features and philosophy remain the same, while the new interface makes the program much easier to learn and use. Although formal testing will await the final version, *5.5* appears to be just as fast as *5.0,* giving it an edge over the current crop of graphical word processors, including *Word for Windows.* There are plenty of 8088 and 80286 machines that can't efficiently run a *Windows* application, so DOS applications such as *Word 5.5* may still have a healthy future.

While archrival *WordPerfect 5.1* merely tacked optional pulldown menus onto its original tough-guy interface, *Word 5.5* risks a complete makeover. Because *WordPerfect for Windows* is still in the future, WordPerfect's approach was a sound one: Mollify existing users by leaving well enough alone. But since Microsoft already positions *Word for Windows* to lure *Word* veterans, the company may mean to nudge users from the nest.

A Classy Face-Lift

The only notable addition in *Word 5.5* is the capability to import Lotus WK3 files. But the interface modifications make this upgrade even more significant than the leap from *4.0* to *5.0.*

The old menus at the bottom of the screen are replaced with a *Windows*-like top-line menu bar. Scroll bars line the screen, and dialog boxes, complete with buttons and list boxes, replace the irritating old menu fields. Even the spelling checker and thesaurus pop up as dialog boxes. Where you used to press <F1> to see a list of menu options, now you just click on an arrow to drop

SNAPSHOT

Microsoft Word 5.5

A mouse-oriented menu interface makes Word easier to learn and use—but old-timers are in for some relearning.

KEY FEATURES

- **Pulldown menus and dialog boxes**
- **Formatting ribbon**
- **Imports WK3 files**

AVAILABILITY

October 1990

PRICING

$450, $50 upgrade from Word 5.0, $75 upgrade from earlier versions

Microsoft Corp.
One Microsoft Way
Redmond, WA
98052-6399
800/426-9400,
206/882-8080

Reader service no. 812

down a list box.

You can still use cursor keys and hot keys, but a mouse is almost essential. *Word 5.5*'s new formatting ribbon, à la *Word for Windows*, lets you select styles, fonts, and character formatting with a mouse click. The ribbon even includes "hot spots." Click twice on *Font*, for example, and up pops the character formatting dialog box. Keyboard curmudgeons will be happy to know that the ribbon display is optional, but they may be surprised at how the ribbon can speed formatting.

Windowing—always a *Word* strong point—has also been improved. You can now cascade or tile windows and expand and contract them by selecting icons. Clicking on any part of a window makes it active.

If you're a *Windows* user, you'll feel at home with the top-line menu titles. Gone are *Word*'s cryptic Library and Transfer menus—utilities are now more logically placed in Utilities, and file operations fall under File.

Style sheets, once buried in the arcane Gallery, are now found in the Format menu. Creating, editing, and attaching styles is much easier—to attach styles you merely click on a paragraph, click on the style sheet icon, and then select the style from a list.

Old Dogs Revisited

Word 5.5 bends over backward for new users, offering superb tutorials, on-line help, and manuals. Microsoft hasn't forgotten its regulars, either, providing a manual for current users and help screens that display charts of old versus new commands. The package includes disks for version 5.0 in addition to *5.1*, so corporate users can switch over smoothly. Still, *Word* veterans are in for some reeducation. Instead of pressing <Esc>TS to save a file, you'll press <Alt>-FS. For bold text, <Ctrl>-B replaces <Alt>-B. Function keys have also changed—instead of using <F6> to select text, you use the mouse or repeatedly press <F8>.

Fortunately, most of the new commands conform to the SAA/CUA standard, so if you've purchased a new application in the last few years, chances are you're familiar with them. Diehards can always revert to *Word 5.0* function keys by remapping the keyboard with the new Customize dialog box.

Word 5.0 printer drivers, dictionaries, and style sheets are still compatible, but you'll need to run macros through a conversion utility, and complex macros may need editing.

Many *Word* users will take this new version as a sign to move on to *Word for Windows*. Others will skip this upgrade and stick with *Word 5.0* until their hardware (or their thinking) is ready to embrace *Windows*.

Unless you're truly mousephobic, take a $50 risk and check out *Word 5.5*. After the initial frustration, you'll find it easier to use than *5.0*—and changing to *5.5* now will make it that much easier when and if you *do* move to *Windows*.

George Campbell is a contributing editor for PC World.

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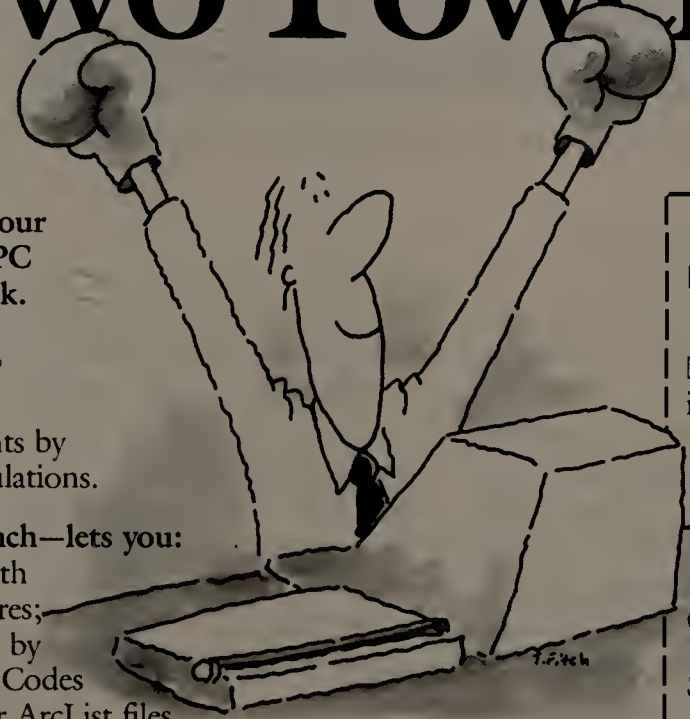

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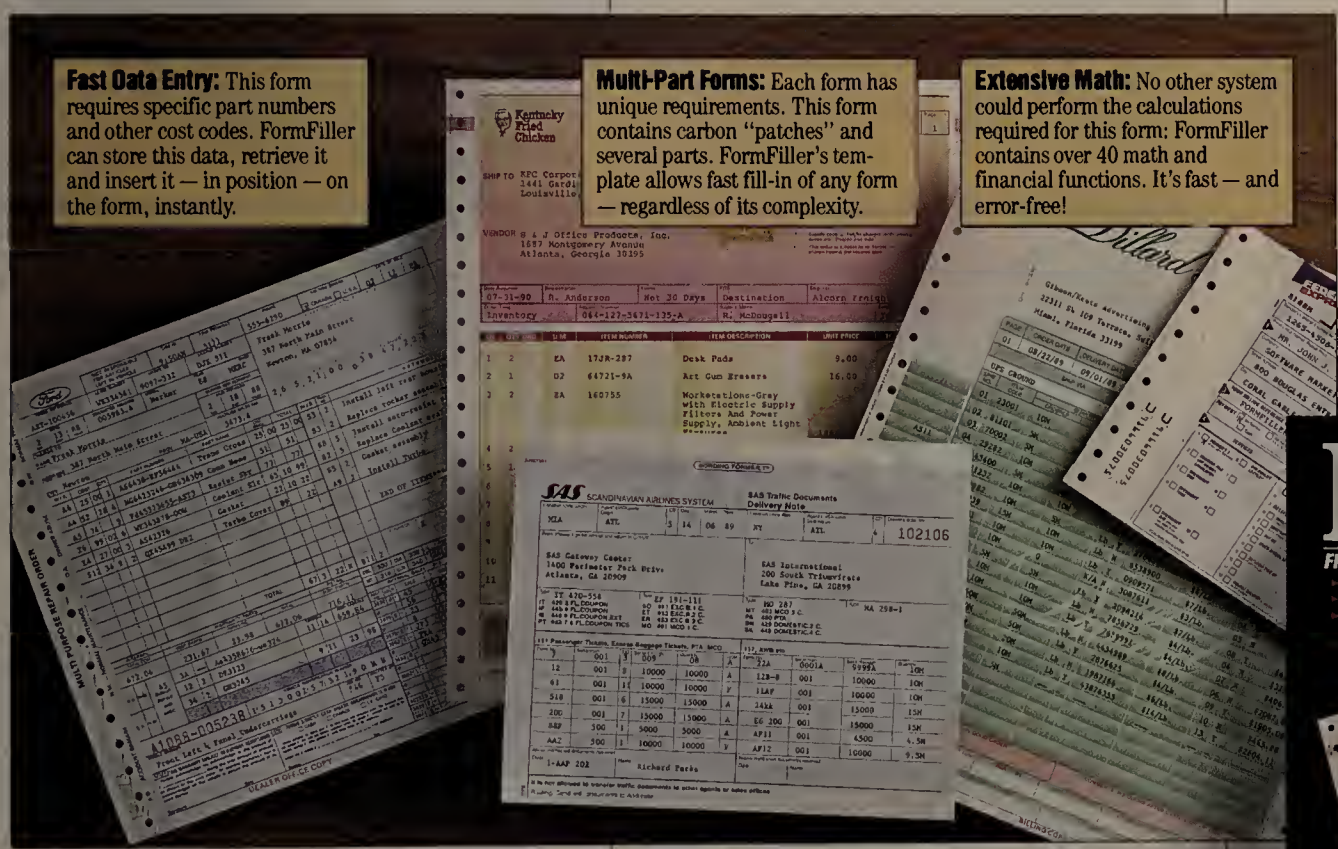
The pre-printed form remains the backbone of information flow. Corporations employ hundreds of thousands of pre-printed forms to gather and distribute information internally and externally. Many of these pre-printed forms contain multiple pages, multiple parts, interleaved carbons and other devices that must be addressed when data entry is performed. More importantly, some forms include legal language, disclaimers and other important notices on the reverse side of each sheet, and may require signatures, making them, in effect, contracts.

As corporations seek a balance between paper and electronic forms, they're placing a high priority on making paper forms more efficient, reducing fill-in time, and establishing connections with their database.

While most forms are still completed by hand or using a typewriter, FormFiller allows this task to be automated using virtually any PC and printer configuration, without special hardware, graphics or dedicated printer stations. Waste, inefficiency and error, inherent in the manual fill-in of pre-printed forms, can grind the flow of information to a standstill, and cost thousands of dollars in lost time and unproductive work.



FormFiller is the ideal fill-in solution for government, insurance, legal and tax forms, building permits, medical forms, shipping airbills and countless others.

FormFiller is the only system specifically designed to accurately fill-in pre-printed forms with pinpoint-precise accuracy — for up to 640 fields! It eliminates the tedious nature of form fill-in, and allows forms, regardless of their type or complexity, to be filled in with unparalleled speed, and without the margin for human error.

FormFiller's advanced mathematical and financial calculation capabilities allow you to enter values and have the system make the calculations (using dozens of built-in formula functions) automatically. These extensive math functions include percentages, exponents, depreciation, amortization, interest, present and future values — even advanced trigonometry functions.

FormFiller also includes a time-saving "Lookup" feature that stores details such as part numbers, phone numbers, shipping and billing addresses, wholesale/retail prices, claim and case numbers and more — than with one menu selection, retrieves them and automatically fills them into proper position in the form.

How FormFiller Works:

Step 1 — Insert The Form Into Your Printer.

The secret to FormFiller's power is its ability to tightly synchronize the computer and printer for precise positioning. You begin by creating a template for each form, matching the exact spacing, position and size for each field or blank on the form and inserting captions, help and fill-in instructions if you like.

Simply insert a sample form into the printer, with the system prompting you for alignment with your printer head. You then invoke FormFiller's "print grid" command. This actually prints vertical and horizontal lines directly on the pre-printed form, with numbers along the top and the left margin. This grid, and the corresponding numbers, are your guide in establishing the coordinates for each print position on the form.

Step 2 — Locate Precise Print Positions for Each Blank.

Using FormFiller's new menu-driven interface, the next step is to create exact print positions for each blank on the form. It's fast and simple — just two keystrokes are required to establish a print position, defining it from starting point to ending point. And FormFiller allows you to adjust your print positions in any direction in increments of up to 1/720th of an inch for pinpoint-precise alignment. You can quickly create custom grids for complex or inconsistently spaced forms.

When the data positions have been located, FormFiller will automatically insert X's to represent characters so you can visually test alignment and inspect the spacing of the fill-in areas.

Step 3 — Preparation of the 'Master Template'.

Once the coordinates for each print position on the form have been entered, you then enhance the "master template" for the form. FormFiller allows you tremendous flexibility to custom design master templates to fit the exact needs of your information flow and accommodate your data entry requirements. This master template controls the entire data entry process.

Step 4 — Swift, Simple Data Entry.

The master template for each form is stored for instant call up and fill-in anytime. FormFiller allows data to be entered into templates using any format: columns, prompts, or into the actual form image. The data is then automatically transferred to exact blank positions on the pre-printed form.

FormFiller's Extensive Math Capabilities.

FormFiller contains dozens of math and financial functions that can be used within the form. These functions can be embedded in the form templates and automatically activated when values are entered into certain fields. This allows interactions and relationships between all fields in the form. If you're filling in a mortgage form, for example, changing one number will change all subsequent values related to that number.

Use Existing Data To Fill In Forms.

FormFiller's advanced "merge" features allow users to instantly merge database information into their pre-printed forms from spreadsheets and relational databases simultaneously.

Your existing data can be quickly imported (without conversion) using FormFiller's improved new import capabilities that support dBASE II, dBASE III, Lotus 1-2-3 (WKS and WK1), DIF and ASCII.

Pinpoint-Precise Accuracy.

Only FormFiller can position data in precise locations on the pre-printed form, using its unique print position "Locator Grid" which actually synchronizes the computer and printer. And FormFiller allows complete control of the printer, including print quality, fonts, attributes, variable page sizes and orientation using dot-matrix, ink jet, daisy wheel or laser printers.

Automatic Look-up And Fill-In.

FormFiller streamlines data entry with its unique "look-up" feature. This powerful function eliminates data entry by providing instant access to details frequently required during fill-in. In preparing an invoice, for example, you can simply enter a part description and FormFiller automatically finds the part number, description, price — even the customer's shipping and billing address.

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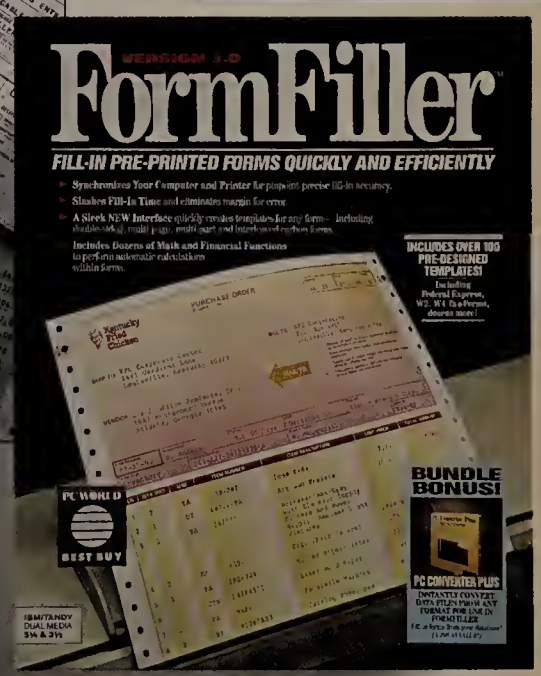

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Money Matters is a less complicated approach to financial management for the home and small office. It combines fast, on-screen transaction handling, instant balance updates, simple check writing, invoicing and detailed financial reporting.

The beauty of Money Matters is that it actually adapts its functionality to the way you run your business, instead of cramming some complex accounting concept down your throat. If you're a contractor, for example, you can easily track costs and hours for each phase of a project. If you own a fleet of taxicabs, you can track income and costs by cab. If you run a small retail store or factory, you can track inventory any way you like for complete financial control.

Get Started Right Out of the Box. Set-up is Done for You.

You don't have to know anything about accounting to become instantly productive with Money Matters. There are no time-consuming set-up procedures or accounting techniques to learn. Choose from 14 pre-defined business categories. When you select one, the account tables are automatically established. Quickly enter starting data into Money Matters' handsome interface and from then on, each function is as easy as writing a check.

The Fastest, Easiest Checkbook Management Concept Ever!

No other software program is as thorough in this area as Money Matters. Payments, deposits and reconciliations can be made automatically, and transactions can be distributed in up to 20 different ways. Money Matters will automatically track and report interest income for you and provide balance sheets, management reports, invoice analysis reports and up-to-the-minute profit and loss statements.

When tax time rolls around Money Matters is there with complete, organized information. And Money Matters automatically monitors credit card and bank account transactions, to help you forecast your cash requirements.

Take Care of Your Customers.

...And your vendors. Money Matters can easily handle up to 4,000 vendor and customer accounts. Track year-to-date figures, print mailing labels, lists, and reports.

Take Care of Your Company.

You'll collect receivables sooner because Money Matters helps you stay better organized so invoices go out on time ... stay on top of late payments ... even automatically add finance charges if you want to. You'll improve your cash flow because you can establish budgets and stick to them. And you can take advantage of vendor discounts automatically. Payroll becomes a snap. Money Matters takes care of computing taxes, writing the checks, completing quarterly reports and more with just a keystroke.

"Money Matters Sounds Great — But My Business Is Different..."

Money Matters was designed around the notion that all businesses are unique, each with a different set of procedures and situations. Because it is so flexible, you can tell Money Matters how you prefer to work and it follows your lead, adjusting to your set of requirements.

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Dozens of built-in formats to get you up and running right out of the box!

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- Receipts/Deposits
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- Automatic Payments
- Payroll Tracking
- Tax Information
- Inventory Control
- Job Costing
- Budgeting
- Personal Financial Management
- Sales Tax Calculations
- Credit Card Accounting
- Transaction Histories
- Expense Analysis
- And Many More

Money Matters Features:

► Easy Set-Up

- 14 pre-designed business categories to choose from
- Account set-up done automatically
- Short-Cuts section
- Easy to enter starting balances
- Customized account names, titles, numbers
- Provides for departmental accounting or subcategories

► Checkbook Management

- Automatic payments
- Automatic bank deposits
- Bank reconciliation
- Distribute transactions 20 ways
- Easy edit & void feature
- Tracks interest income

► Special Tasks

- Organizes tax information
- Profit & Loss
- Optional balance sheet
- Management reports
- Invoice analysis report
- SuperTrack reports
- Automatic budgets
- Provides on line account activity reports
- Detail retained for prior period adjustments

► Invoicing

- Prints three types of invoices
- Maintains up to the minute bank balances
- Calculates finance charges, due dates, and discounts automatically

► Customers/Vendors

- Holds up to 4,000 vendor & customer cards
- Evaluate vendor & customer accounts
- Track year to date figures
- Print mailing labels, lists & reports
- Store name, address & telephone numbers

► Bank Accounts

- Handles up to 15 bank accounts & credit cards
- Includes checking, savings, money market and more

► Forms

- 3 styles of invoices
- 2 styles of checks
- Receipts
- Mailing labels
- Supports laser forms

► Short-Cuts

- Pop up lists of vendors, customers
- Pop up list of accounts
- Speed Search feature
- Find key
- Macros for repetitive entries

► Reports

- Optional Balance Sheet
- Income Statement
- Check or Receipt Register
- Account Analysis Report
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Diskette Manager 4 is a state-of-the-art catalog/labeling system. New features include file-by-file comments, and the ability to use disk volume labels as disk names. Create, modify reports and labels with an innovative new report generator. Pre-designed reports and labels are included. Catalogs hold up to 1000 diskettes or 32,000 diskette files.

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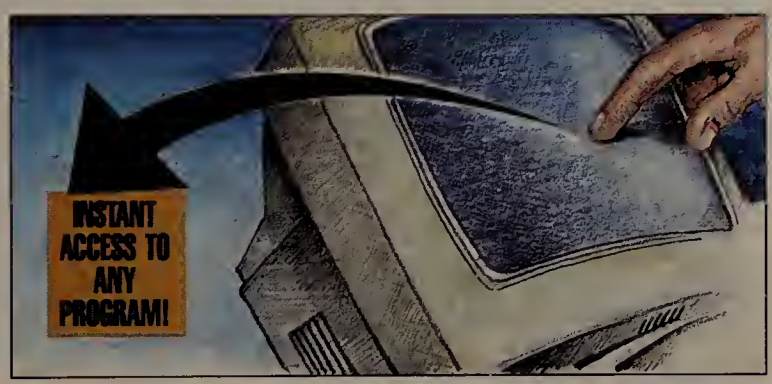

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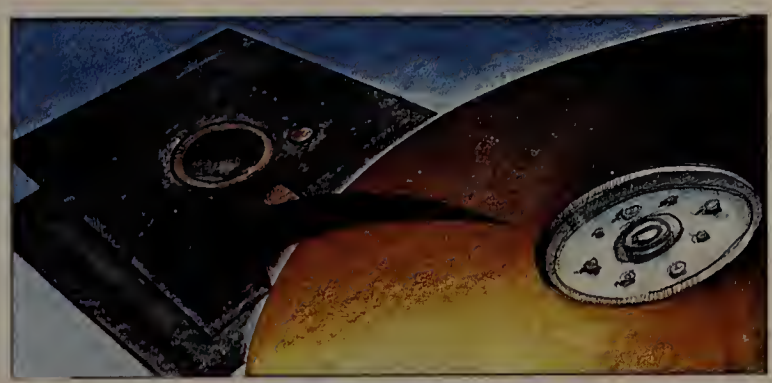

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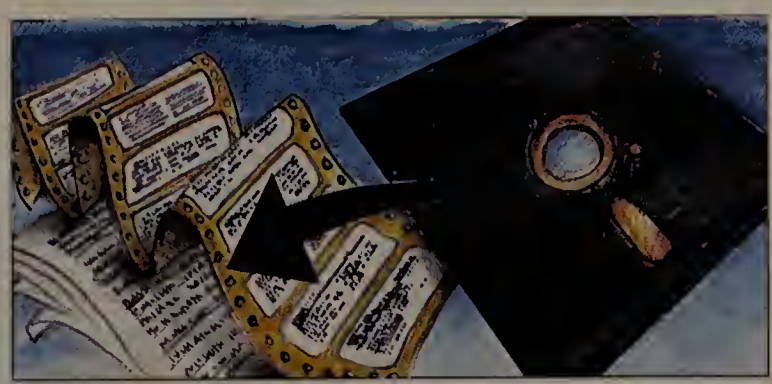

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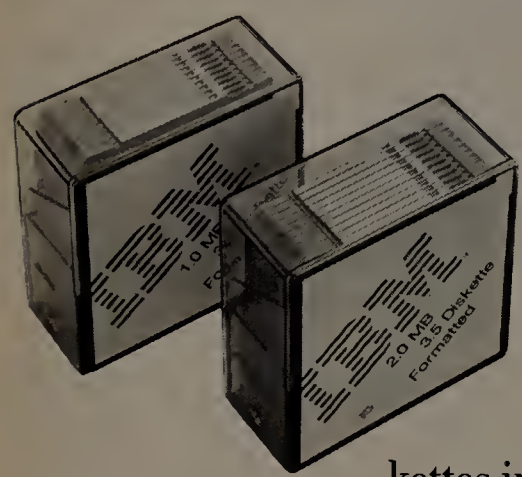

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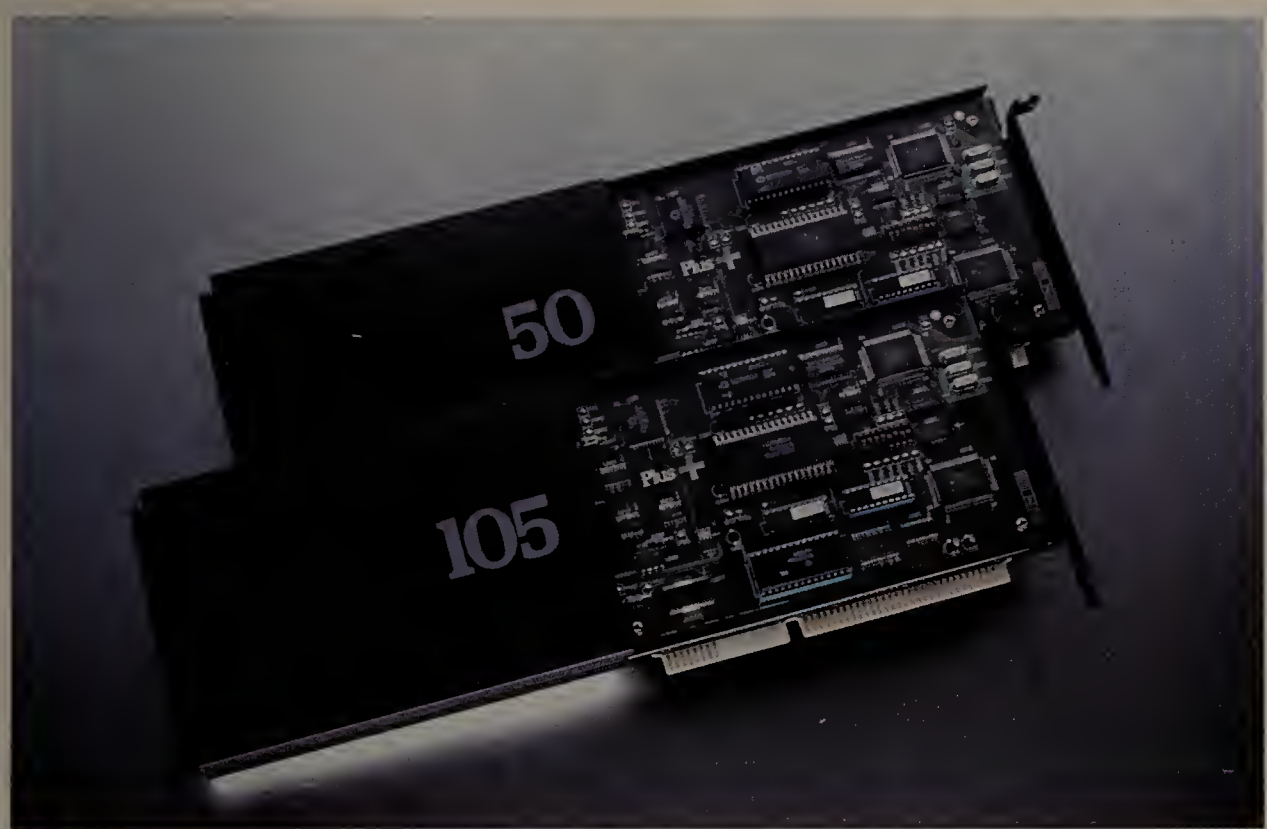
Greater speed and capacity give the Hardcard II XL the performance that 286 and 386 users demand.



Exploiting cache memory, the Hardcard II XL boasts an effective access time of 9ms—which Plus Development claims is the world's fastest for a 3½-inch drive. Like Plus's other drives, the Hardcard II XL installs quickly in an expansion slot and should prove highly reliable.

TJ Byers

The latest incarnation of Plus Development's popular hard disk on a board may be just what the doctor ordered for vintage or small-footprint 286 and 386 PCs whose hard disks are bursting at the seams.

The Hardcard II XL 50MB and 105MB models are roomier, faster, and cheaper than their predecessors. Prices are a slim $579 (50MB) and $999 (105MB), with Plus Development touting street prices of $399 and $699, respectively.

Pump Up Performance

The big selling point of the Hardcard II XL is its "effective" access time of 9ms, a rating derived from the throughput of the 17ms drive in combination with a hardware disk cache. This is twice as fast as the Hardcard II's effective access time (see "A New Deal for the Hardcard," March 1990).

The Hardcard II and II XL both have 1:1 interleave, 64K of static RAM cache, and a 16-bit interface. (The original Hardcard has an 8-bit interface.)

However, the effective access time is a function of the RAM cache, and applications that deal with large files, such as *Windows* programs, won't benefit significantly from this scheme. The average access time of the XL disk itself is 17ms, which is still faster than most AT-compatible hard disks in use today.

Capacity is also increased, with disk sizes of 50MB and 105MB for the Hardcard II XL, as opposed to the 40MB and 80MB capacities of the Hardcard II.

Like all Hardcards, the Hardcard II XL is ruggedly constructed. It boasts a mean-time-between-failure rate of 60,000 hours—about seven years of continuous use.

Quick Installation

Hardcard installation is fast and straightforward. Just pop the hood on your PC, and plop the Hardcard into an empty 8/16-bit slot. The Hardcard works with all existing hard disk drives, and you can install up to four Hardcards in a system, provided you have that many free 8/16-bit slots.

A simple menu-driven installation program lets you set up the drive for DOS, OS/2, or Advanced/NetWare 286 SFT. *IBM PC LAN* and *3Com 3+* networks are also supported.

The installation program automatically partitions the disk into logical drives and places them after the last logical drive. That's a big improvement over the Hardcard II's method of elbowing its way into the D: position and pushing the other logical drives up a notch, which played havoc with your batch files and path settings.

As a fast, easy storage upgrade for improving the performance of an aging or limited-capacity machine, the Hardcard II XL is hard to beat. It's reliable, and it comes with a two-year warranty. It slips into your PC without fuss (except if you have an XT clone, in which case you still must turn to the original 8-bit Hardcard).

And Plus has gotten the message on price—particularly for the 105MB board, which is cheaper than many half-height drives of equal capacity.

TJ Byers is a contributing editor for PC World.

SNAPSHOT

Hardcard II XL 50MB and 105MB

Low cost and high speed make the Hardcard an excellent hard disk upgrade for vintage and small-footprint 286 and 386 PCs.

KEY FEATURES

- **9ms effective access time**
- **Two-year warranty**
- **Works with existing hard disk**
- **16-bit interface**

AVAILABILITY

Immediate

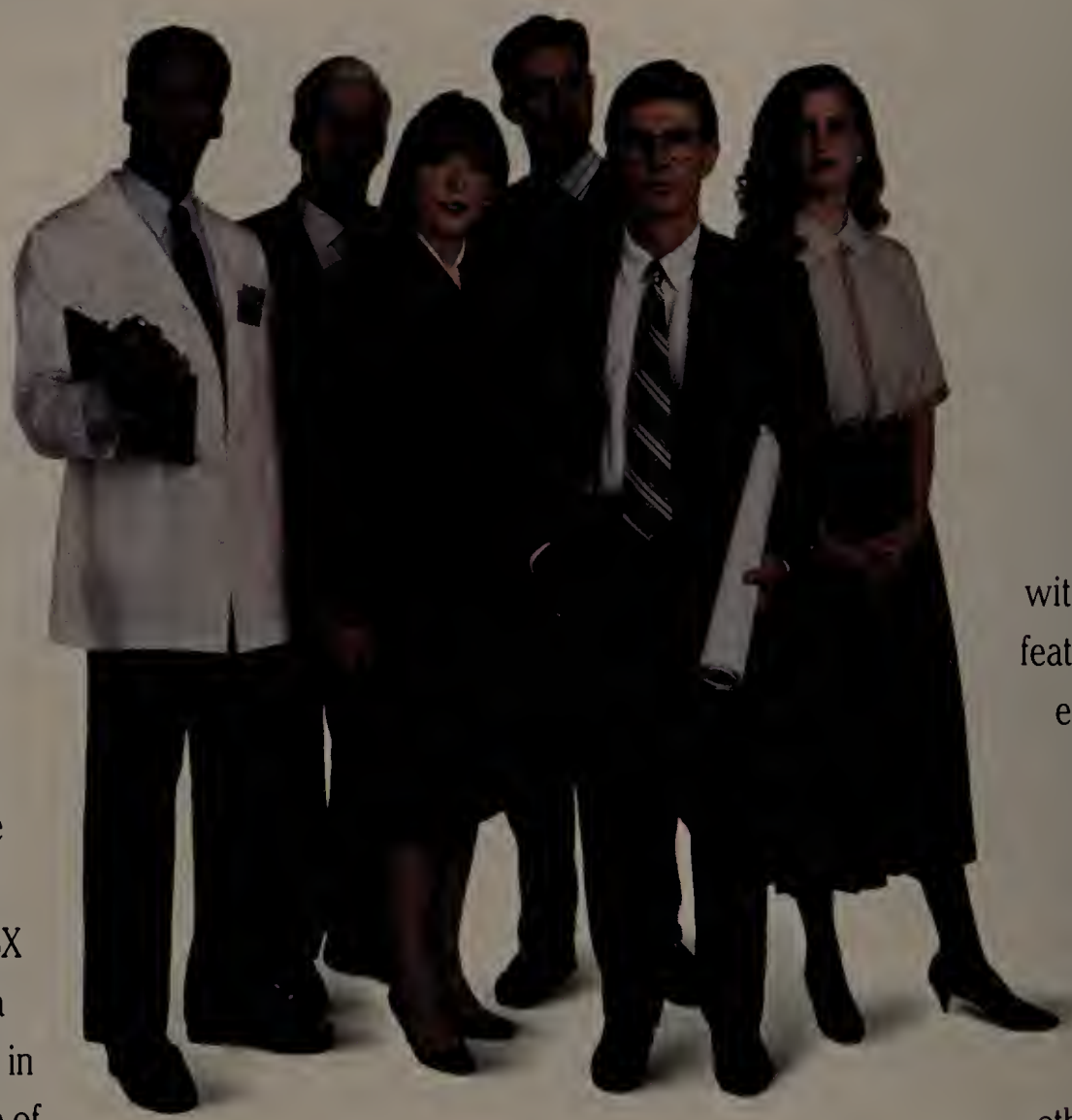
PRICING

50MB $579, 105MB $999

Plus Development Corp.
1778 McCarthy Blvd.
Milpitas, CA 95035
800/624-5545,
408/434-3309 (fax)

Reader service no. 818

What does Compaq give 386 users who expect the moon?



Giving demanding users the best PC possible is a tradition at Compaq. A tradition we upheld when we introduced the world's first PCs based on Intel's 386 and 386SX microprocessors. And a tradition that continues in our comprehensive line of desktop PCs.

Within this line you'll find six different levels of 386 performance and affordability. And a PC designed to give you the perfect balance of features and power. You'll find the reliability and compatibility you've come to expect from Compaq. Plus the flexibility to choose from a wide array of optional features.

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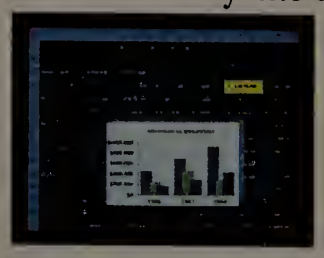
Come look at the COMPAQ DESKPRO 386N Personal Computer, for example. It's a full-function PC with breakthrough features for networked environments. As a stand-alone PC, its 16-MHz 386SX microprocessor handles all of the general business applications our other 386SX-based PCs run. With so many integrated features, you can take care of your expansion needs using only two slots.

And it comes with a host of unique network features like multilevel security, making it the best full-function PC for connected environments. All of this fits neatly into a space-saving design.



The COMPAQ DESKPRO 386S Personal Computer is also designed to handle general business applications. Its 16-MHz 386SX microprocessor gives you exceptional 386 performance. And its 32-bit architecture lets you run today's popular business software. It also offers the flexibility to run tomorrow's advanced business software.

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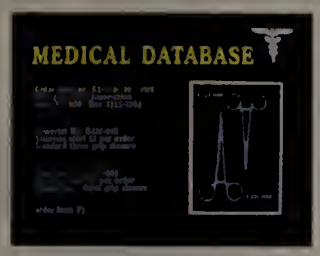
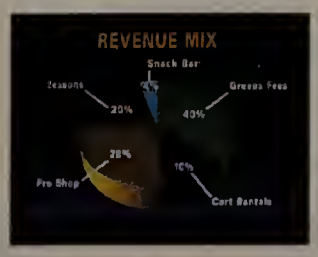
The stars.

Project managers and other general business users will find everything they need to manage databases and speed through complex spreadsheets in the COMPAQ DESKPRO 386s/20 Personal Computer. It delivers the maximum in 20-MHz 386SX performance and a broad range of integrated features.



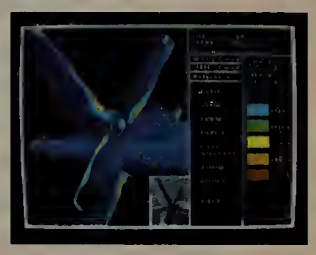
The COMPAQ DESKPRO 386/20e Personal Computer is for experienced users. It's perfect for demanding applications like presentation graphics. And it's loaded with high-performance features like an advanced cache architecture. So it runs up to 50% faster than other 20-MHz, non-cached 386-based PCs.



For users doing similar jobs, but with more stringent performance needs, we offer the COMPAQ DESKPRO 386/25e Personal Computer. Its 25-MHz 32-bit performance lets you fly through financial analysis as well as other demanding applications.

It's the perfect personal computer for people who are serious number crunchers, administrators who manage massive loads of information and engineers who work on generating complex two-dimensional CAD drawings.

At the most demanding level of 386 computing are the power users who do graphic-intensive applications like 3-D CAD drawings and other performance-intensive applications. These people need the kind of high performance that the COMPAQ DESKPRO 386/33L Personal Computer delivers. It combines the fastest 386 chip with high-performance innovations. And it lets you easily upgrade to the power and performance of a 486 chip.



If you're looking for the 386 desktop PC that simply works better for whatever you do, call 1-800-231-0900, Operator 129. In Canada, call 1-800-263-5868, Operator 129.

COMPAQ

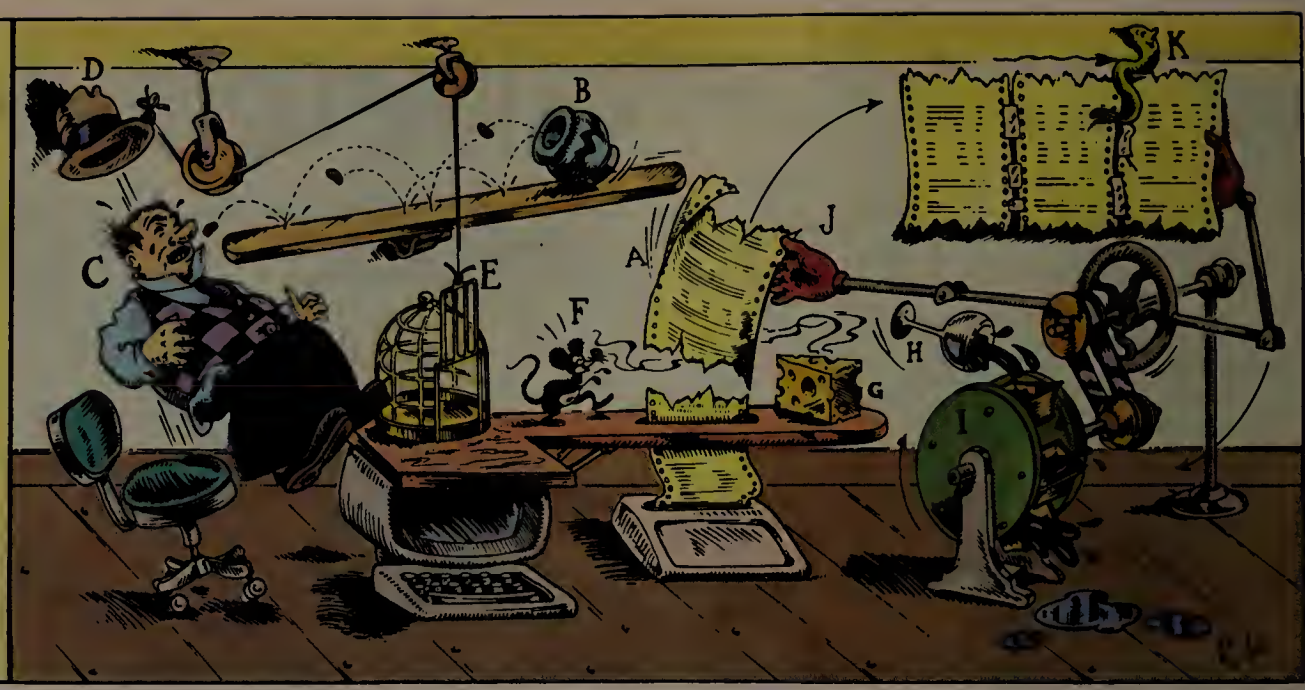
It simply works better.

RISING SPREADSHEET (A) KNOCKS MEXICAN JUMPING BEANS (B) INTO MOUTH OF NEUROTIC MAN (C) WHO IS SO DISCOMBOBULATED THAT HIS HAIR STANDS ON END, DISLODGING HAT (D) WHICH OPENS CAGE (E) AND RELEASES EPICUREAN MOUSE (F).

MOUSE, INSPIRED BY SCENT OF PERFECTLY AGED CAMEMBERT CHEESE, GNAWS THROUGH SPREADSHEET, ONLY TO DISCOVER HE HAS BEEN FOOLED BY AROMA OF OVER-RIPE GORGONZOLA (G).

IN A FIT OF PIQUE HE SPILLS VINTAGE WINE (H) INTO WATER-WHEEL (I) WHICH TURNS PULLEY THAT CAUSES GLOVE (J) TO GRASP SPREADSHEET AND MOVE IT TO TAPING AREA.

SHEET IS TAPED SECURELY IN PLACE BY TRAINED ADHESIVE TAPE WORM (K).



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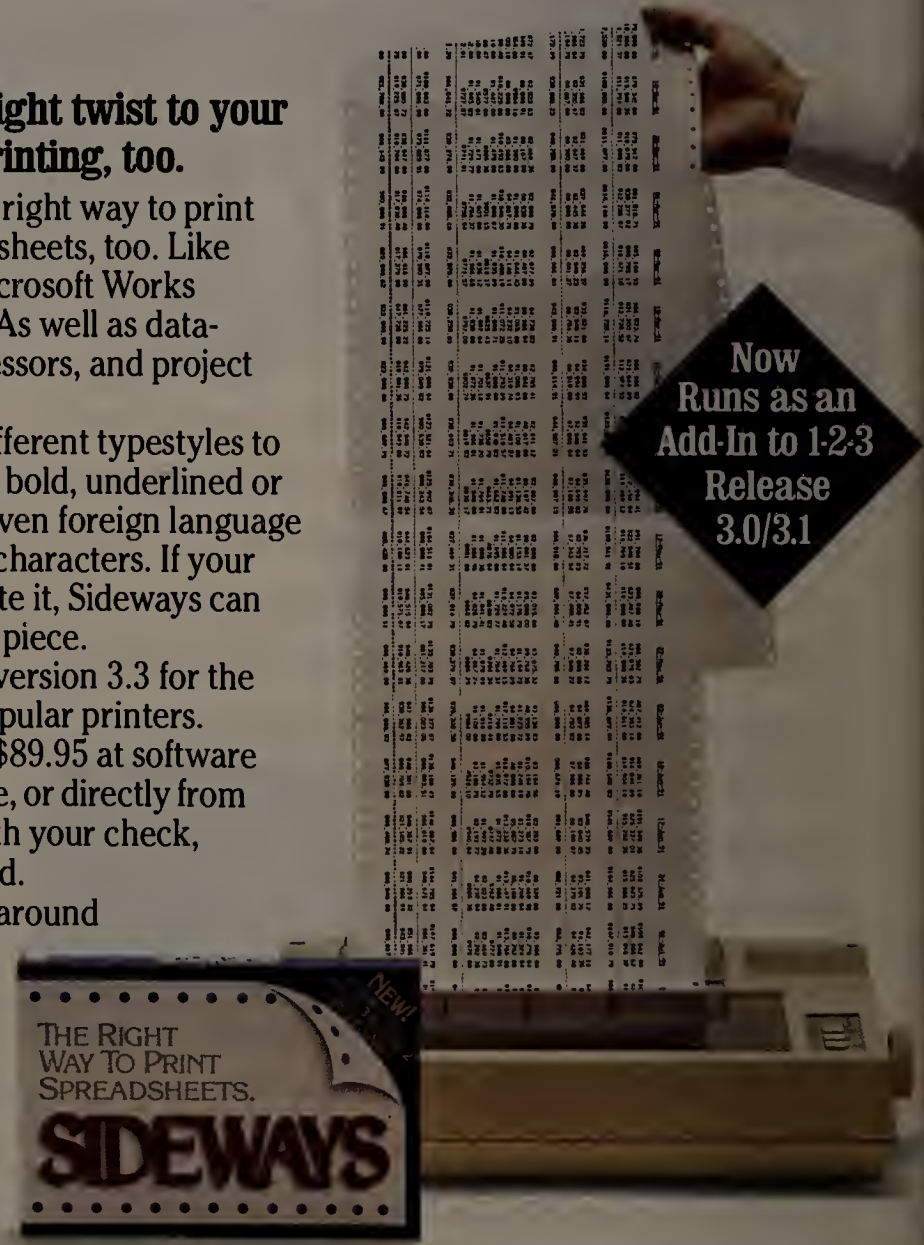

FUNK SOFT WARE

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Sideways version 3.3 works with all releases of 1-2-3 as well as other software. Add-in capability requires 1-2-3 Release 2, Release 3, or Symphony.

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PRODUCT OUTLOOK

Edited by MIKE HOGAN

UltraLite 286V, 1500 HD

Widely Varying Notebook Entries From NEC and Tandy

Tandy's 1500 HD fits both a floppy and a fast 20MB hard drive in a tidy 6-pound package.

With the footprint clearly defined, the notebook field has become crowded. Now two of the oldest purveyors of portables have new entries that reflect their different strategies.

You pay twice as much for an NEC UltraLite 286V as you do for the Tandy 1500 HD—$3999 versus $1999 list price—but NEC provides more processor speed, a bigger and sharper display, greater expandability, and a more sophisticated package. You also get twice the parts; the 3½-inch floppy drive is an external device. Like the Tandy, it packs a fast 20MB hard drive, measures about 12 by 10 inches, and is under 2 inches high.

With a 12-MHz 286 CPU and the ability to boost memory to 5MB, you can run some of the most demanding applications when you're on the road. Even *Windows 3.0* looks good on its 10-inch backlit VGA-compatible LCD display. NEC says users would rather have the full-sized VGA screen in a 6½-pound package than an internal floppy.

Not so, says Tandy; the 1500 HD contains a 3½-inch floppy along with a fast 20MB drive and is still able to keep its weight under 6 pounds. The machine's NEC V-20 CPU running at 10 MHz is nonstandard, but it's adequate for most word processing and spreadsheet tasks. The 640K standard memory can be augmented by 1MB—again, adequate for most tasks. Of more concern is the 640 by 200 CGA display. That's a little behind the technology curve, but the *DeskMate* environment that automatically boots up on the machine looks good.

Battery packs are $100 and last 3½ hours each. NEC's 1MB memory card costs $499, and a 4MB card is $1999. A 2400-bps combined modem and send-receive fax is $799. —*Mike Hogan*

IN BRIEF

While NEC's new UltraLite shoots for the cutting edge of notebook technology, Tandy has fashioned a midrange machine priced for the masses.

NEC Technologies Inc.
1255 Michael Dr.
Wood Dale, IL 60191
708/860-9500
Reader service no. 742

Tandy Corp.
1800 One Tandy Center
Fort Worth, TX 76102
817/390-3011
Reader service no. 743

INSIDE PRODUCT OUTLOOK

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124 **Infinity Desktop** Small-footprint SX comes in four different models.

128 **Dell 425TE, 433TE** Nifty design in a pair of fast-performance EISA towers.

128 **Dycam Model 1** Digital camera takes pictures and uploads images.

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132 **Packard Bell Force 386/33, Force 386X** Two low-cost machines give you the power of a 386.

136 **Howtek Personal Color Scanner, UMAX UC300** Capture up to 16 million colors per image.

136 **Little Big LAN, The $25 Network** Create a network on a shoestring.

140 **PM9600 SA V.32/V.42bis,9600EX** Quicker transmissions for less.

GridCase 1550SX

Grid's Laptop: Windows on the Road

Grid's 20-MHz GridCase 1550SX is the first laptop specifically designed for *Windows*. A muscular 386SX platform, it comes with a keyboard pointing device called Isopoint, which solves the mouse-support problem that has kept *Windows* off most laptops.

Isopoint is a thin tube about the diameter of a drinking straw, located just beneath (and parallel to) the <Space> bar. You roll the tube with your thumb to move the cursor up and down; slide it from side to side to move the cursor laterally. Buttons on each side provide clicking capability. The Isopoint is 100 percent compatible with the Microsoft Mouse and much easier to use than a trackball or touchpad.

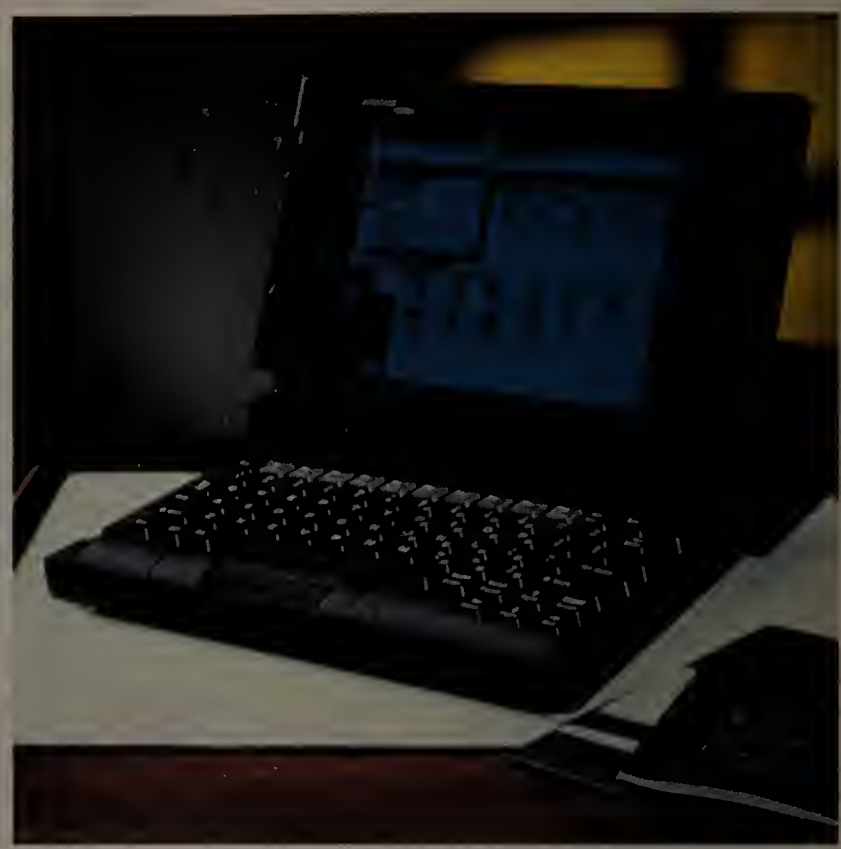
Additional *Windows*-enabling features include a 20-MHz 386SX, 2MB of RAM expandable to 8MB, a VGA-compatible screen, and a fast 60MB hard disk with a 64K disk cache. The $6295 list price includes *Windows 3.0*. Substitute a 120MB hard disk and pay another $700.

At 14.6 pounds (including built-in floppy drive, battery, charger, and cables), the 1550SX is fairly light, but its 2-hour battery life is relatively short. The keyboard features dedicated cursor keys laid out in the standard inverted T, but the <Page Up> and <Page Down> keys are aliased, as is the numeric pad. These are small prices to pay, though, for the convenience of running *Windows* on your desktop and on the road. —*Michael Goodwin*

IN BRIEF

A pointing device makes this full-powered laptop a true Windows platform.

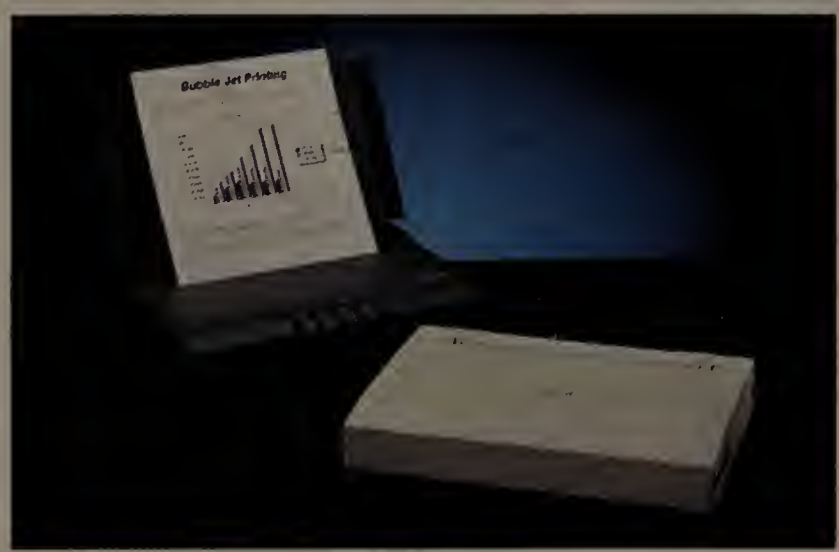
Grid Systems Corp.
47211 Lakeview Blvd.
Fremont, CA 94538
800/222-4743
Reader service no. 740



This full-featured Windows platform, the Grid 1550SX, includes a keyboard pointing device that solves laptop mouse-support problems.

Canon BJ-10e

Light and Compact Printing On the Go



Perfect for your briefcase, the 4.6-pound Canon BJ-10e lets you print wherever your laptop can compute.

Some people never leave the office; others bring it with them wherever they go. Today's powerful laptops make that possible, but you usually can't print until you return to the office. Now Canon offers a mobile printing solution.

At 4.6 pounds (including batteries) and $499, Canon's BJ-10e won't strain your back or your budget. The printer offers high-quality text printing and 360-dpi graphics in a box small enough to slip into your briefcase. The 12-by-8½-by-2-inch printer uses the same bubble–ink jet technology as its larger sibling, the BJ-130e, allowing for quiet 45db operation. And it emulates both the BJ-130e and IBM's Proprinter X24E, simplifying software support.

Typefaces include Courier and Prestige Elite in 10, 12, or 17 characters per inch (cpi) as well as proportional spacing. A 37K buffer will eventually allow for the downloading of soft fonts when Canon makes them available. The BJ-10e prints text at a speed of 83 to 142 characters per second, depending on the number of characters per inch. Print speeds are the same in either draft or letter-quality mode.

The BJ accepts letter- or legal-sized paper, envelopes, and 3M and some other brands of transparencies. A 30-sheet paper feeder adds $90 and 1.8 pounds to the package. The $50 nickel-cadmium battery is good for printing about 30 pages between recharges; a 1.3-pound AC adapter is standard. Replacement printhead cartridges cost $25 and last for about 700,000 characters each. —*Daniel Tynan*

IN BRIEF

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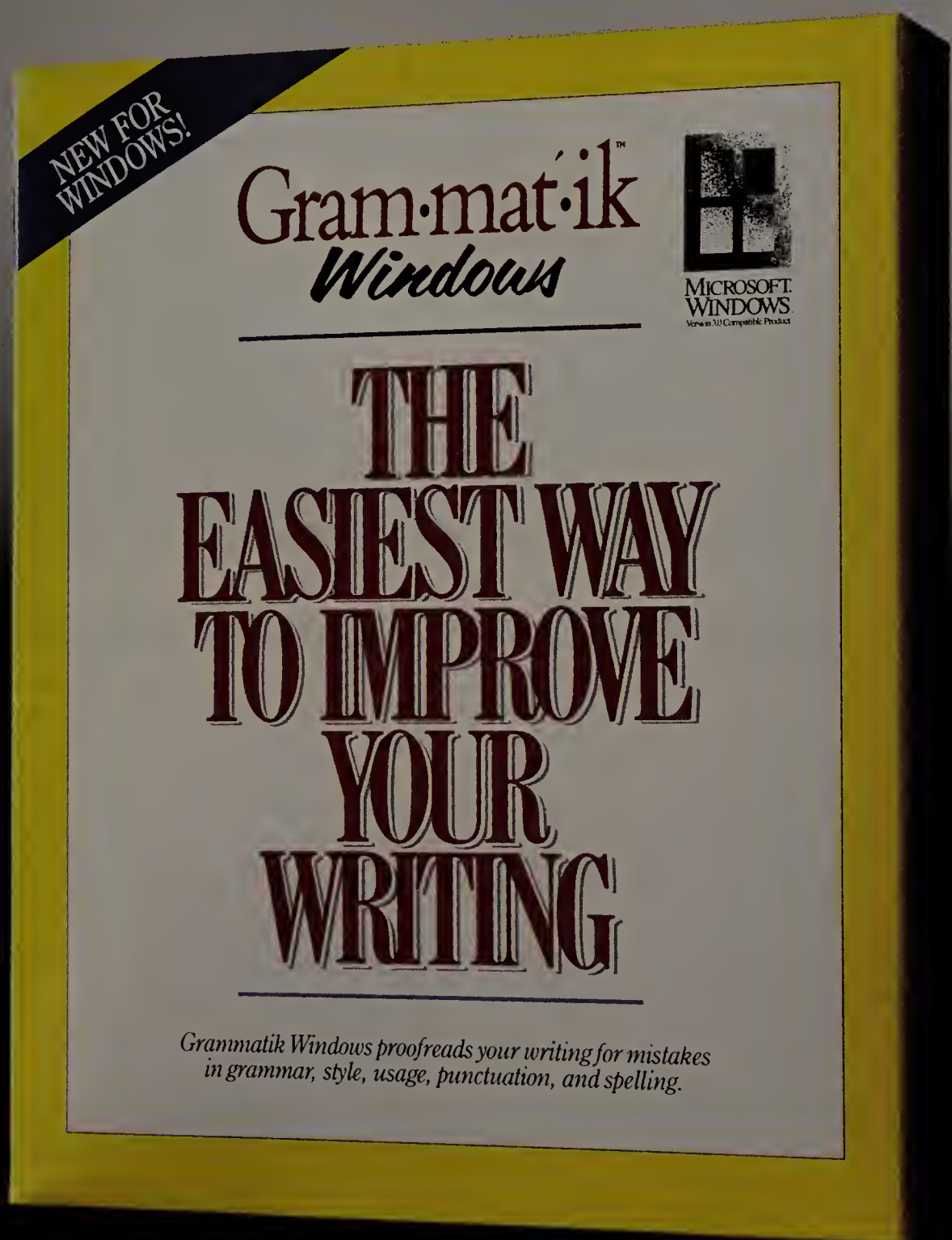

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Presentation Team 2.0

Better Integration for Presentation Graphics and Text

In addition to a WYSIWYG work area, Presentation Team 2.0 gains smooth integration between its text, graph, and drawing modules.

Presentation Team has always played in the shadows of *Harvard Graphics* and *Freelance Plus,* but Digital Research hopes that smoother integration among *Presentation Team 2.0*'s modules will make it a more successful contender.

Digital Research's previous version enjoyed certain advantages over its more powerful rivals, a graphical user interface being the most notable. Where *Harvard* and *Freelance* make you fill in blanks in a separate screen, *Presentation Team* had a WYSIWYG work area that displayed the changes to your presentation as you made them. What's more, it excelled at word charts—the most-used portion of any business presentation package.

But *Presentation Team* was hobbled by a lack of integration among its text, graph, and drawing modules, which forced you to bounce between them. The program also lacked certain essentials, such as the ability to import *1-2-3* WK1 files.

Version 2.0 corrects both these problems and adds many other enhancements. Word chart, graph, and drawing modules are now fully and smoothly integrated around the WYSIWYG work area, making it a snap to build and edit visual images. In addition to accepting WK1 files, the program includes an integrated version of Inset Systems' *HiJaak* file conversion utility. And Digital Research has developed a presentation manager that makes it easy to organize and output visuals.

Additionally, you get the ability to rotate text (by 1-degree increments on PostScript printers and 90-degree increments on other printers), automatic conversion of colors to black and white for output on standard printers, and up to 16 colors per chart (previously 8). Users will also find on-line, context-sensitive help, and network support.

The $495 package still lacks many of the more powerful charting capabilities offered by *Freelance Plus* and *Harvard Graphics,* such as high/low/close charts and dual *Y*-axes. *Presentation Team*'s drawing tools don't include any way to smooth curves, and its clip-art library (at 300 pieces) is notably smaller than *Freelance Plus*'s (900) or *Harvard Graphics*' (500). But where else can you find all the basics in an easy-to-use, WYSIWYG shell? For many users, that simplicity outweighs the absence of exotica.

Presentation Team 2.0 requires DOS 3.0 or a later version, 640K of memory, a hard disk, a graphics display, and a pointing device. —*Patrick Marshall*

IN BRIEF

Version 2.0 brings *Presentation Team* the integrated features of the leaders, along with WYSIWYG editing.

Digital Research
P.O. Box DRI
Monterey, CA 93942
408/649-3896,
408/646-6248 (fax)
Reader service no. 753

Back-It 4

Taking the Boredom Out of Backup

Backing up your data gets exciting only when you forget to do it and your hard disk crashes. Gazelle Systems does away with the modern equivalent of Chinese water torture with *Back-It 4,* a reworked version of *Back-It 3.1* that the company claims is fast, simple, and versatile.

Rather than offering different interfaces for different skill levels, *Back-It 4* bridges the gap between novice and expert with footnotes at the bottom of the screen and context-sensitive help.

Back-It 4's cleaner menu system leaves out the details until you need them. The first screen shows the four basic functions: Backup, Restore, Configure, and Quit. If you simply want to back up or restore your hard disk, a "direct" option appears from a pulldown menu, and you're prompted to answer the obvious questions about source and destination drives.

IN BRIEF

Back-It 4 is faster and easier to use, with a simplified interface, multilayered help screens, and the ability to automate 50 backup routines.

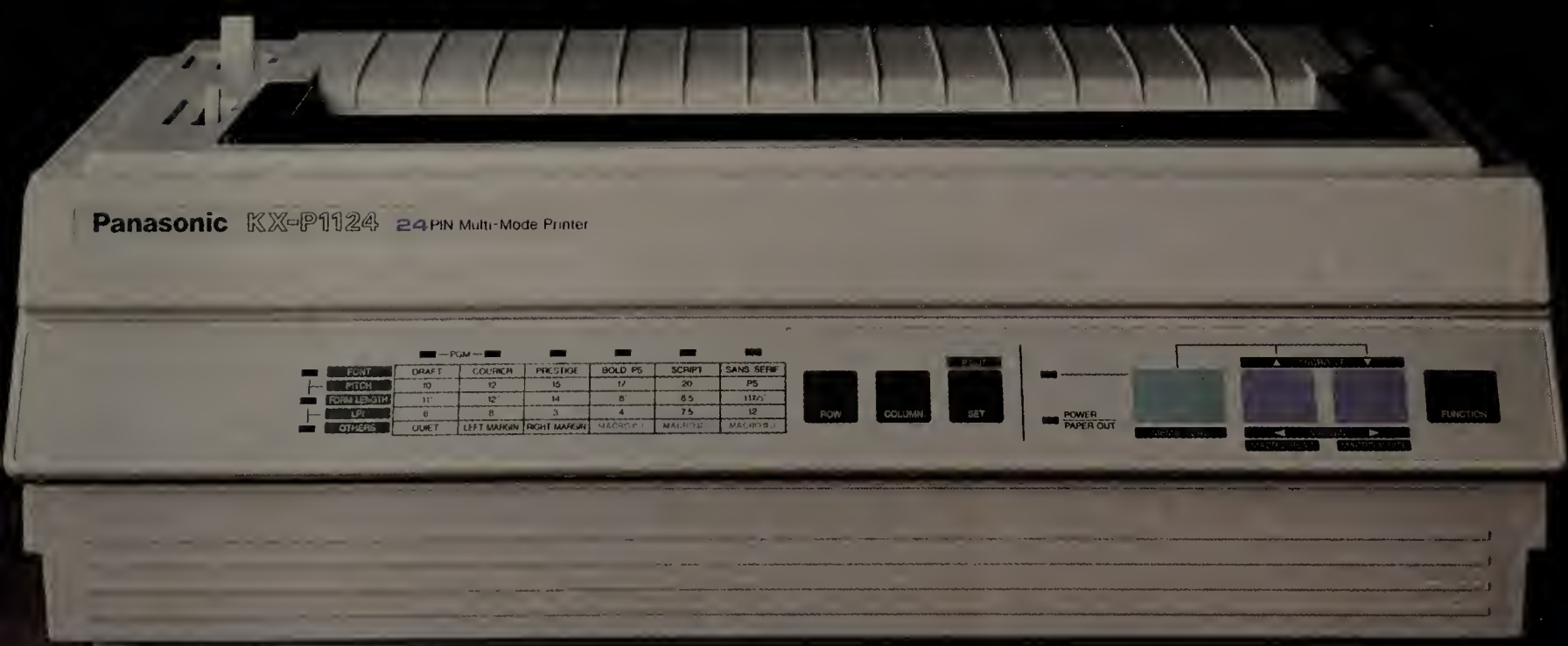
Gazelle Systems
42 N. University Ave. #10
Provo, UT 84601
800/233-0383,
801/373-6933 (fax)
Reader service no. 759

You can move faster still if you take advantage of *Back-It 4*'s preset function, which lets you create up to 50 custom backup routines—for instance, all WK1 files or only changed files—and is accessible from the Back-Up Manager. A new data compression technology actually increases the speed of the backup while compressing. *Back-It 4* can back up to anything recognized as a DOS device, including Bernoulli Boxes, DAT devices, and network drives.

Back-It 4 1.0 retails for $195, but through January 1991 it has an introductory price of $169, with the *GZFORMAT* disk formatting program as a bonus. Upgrades from any version are $40.

Back-It 4 requires DOS 2.0 or a later version, 384K of RAM, and a mass storage device. —*Melissa R. Riofrio*

To become the hottest name in dot matrix printers you simply build one terrific printer



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And we've just introduced what may well be the quintessential office printer for the 90's, the KX-P1654. A wide-carriage 24-pin that rockets along at up to 375 characters per second. With print quality approaching that of lasers.

Chances are, your first Panasonic printer will lead to another, and another, and another.

For further information on Panasonic Dot Matrix Printers, see your Panasonic dealer, or telephone toll-free **1-800-742-8086.**

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Circle 231 on reader service card

Dauphin 3000SX

Colorful Computing on the Road

At $9995, it isn't cheap, but Dauphin Technology's 3000SX makes a movable feast of color VGA graphics, thanks to some tasty active-matrix display technology.

The thin-film panel on this pricey laptop is, in effect, a single 10-inch-diagonal semiconductor. Its surface is etched with about a million transistors—three per pixel to mix just the right amounts of red, green, and blue for crisp, 640 by 480 color resolution. It's currently limited to the eight primary colors, but Dauphin says that new graphics drivers under development should soon enable each transistor to produce several different shades of the three primaries to yield 256 colors.

The power draw of this 20-MHz 386SX-based laptop makes it strictly a plug-in-and-play proposition. But at 16 pounds, it's light enough to move around if you want to give on-screen slide shows or show your engineering drawings to co-workers down the hall or across the country.

You won't lack storage space for those graphics-intensive applications, either. The Dauphin 3000SX packs a 19ms, 200MB hard drive and 2MB of memory, upgradable to 8MB on the system board. There's also a socket for a 387SX coprocessor, a half-length 8/16-bit slot for an add-on, such as a networking card, and a fax/ modem slot for Dauphin's upcoming 2400-bps fax/ modem. You'll also find two serial ports and parallel, external floppy, and external display ports, as well as a 100-pin port for Dauphin's $220 expansion bus, which holds one 8/16-bit card. —*Mark Henricks*

IN BRIEF

One of the first implementations of active-matrix color displays, this laptop also packs the power and storage you need for portable graphics applications.

Dauphin Technology Inc.
1125 E. St. Charles Rd.
Lombard, IL 61048
800/782-7922,
708/627-7618 (fax)
Reader service no. 748

The Dauphin 3000SX gives you portable VGA color, thanks to its active-matrix display technology, but you have to pay a hefty price.

Infinity Desktop Computer

The Ultra-Small SX

Downsizing is the name of the game in 386SXs, and Falco's Infinity Desktop goes most SXs a few inches better—without giving up any of the necessities.

At 13.6 by 10 inches, the 16-MHz PC saves you more than 2 inches in width and almost 6 inches in depth over the 16-by-15.6-inch footprint of IBM's 55 SX. Its 2.75-inch profile is also more than an inch lower.

Each Infinity model comes with 1MB of RAM, expandable to 8MB on the motherboard, which also stocks a super-VGA (1024 by 768) controller, a 387SX math coprocessor socket, and one serial and two parallel ports. A floppy drive controller and an Integrated Drive Electronics (IDE) hard drive connector are also on the motherboard, enabling you to add Falco hard drives of up to 200MB without using a slot.

The two 8/16-bit expansion slots for add-ons such as a fax board or modem seem a little stingy; even IBM offers three, and most SX makers give you more. On the other hand, the Falco machine doesn't need an internal fan for cooling, so there's no annoying hum.

The Infinity Desktop comes in four models, ranging from a mere $1170 for a diskless station to a still-reasonable $2765 for a single-floppy system with a 100MB hard disk. Add another $300 to $700 depending on your choice of monitor, including a super VGA at $600 and a multiscan at $685. —*Susan Lusty*

A high degree of integration on the motherboard makes the Infinity Desktop as much as 12 square inches smaller than other 386SX systems.

IN BRIEF

Nearly the smallest SX computer you'll find, the Infinity Desktop asks you to trade a little expandability for a lot more desk space.

Falco Data Products, Inc.
440 Potrero Ave.
Sunnyvale, CA
94086-4117
800/325-2648,
408/745-7860 (fax)
Reader service no. 754

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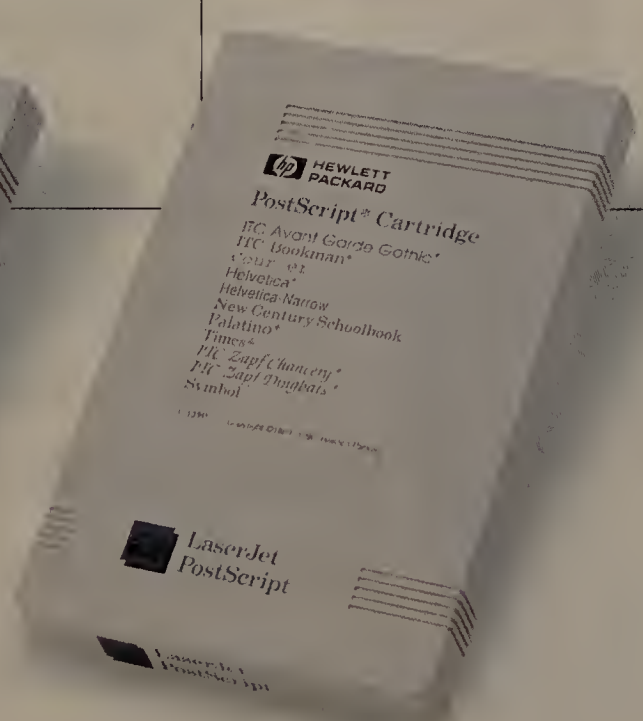

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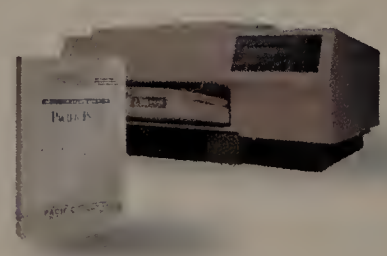

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PhoenixPage

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At Toshiba, we think that designing a portable computer to fit real live human beings can make the difference between a computer you love and a computer you merely tolerate.

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For a free brochure or the name of your nearest Toshiba dealer, call 1-800-457-7777.

Sales results based on worldwide installed base of lap tops, per 1989 Dataquest Inc. study Customer satisfaction results based on PC Magazine, 9/25/90 issue

MORE PORTABLES THAN ANYONE ELSE.

Next, you'll find the keyboard to be immediately familiar, since it's what you're already used to. All of the key spacing and sizes are standard.

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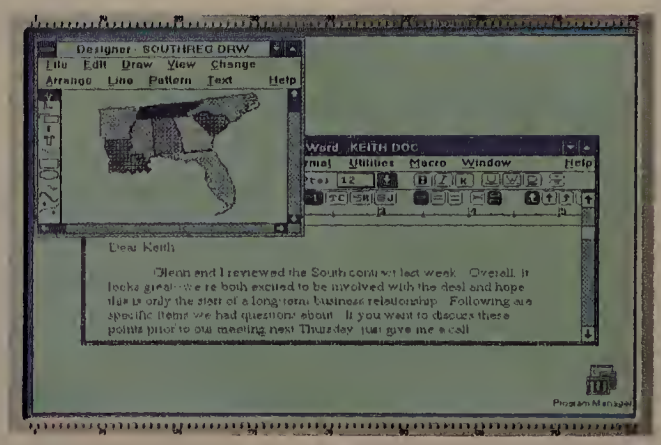
Plus, you'll undoubtedly appreciate the T1200XE's other humane features like a slim line battery pack and AutoResume,™ which lets you pick up exactly where you left off. No grand reopening of the system, program and file every time you want to start work again.

The only thing you'll notice we've skimped on is size and weight. After all, what good is a portable if you can't take it with you?

With notebooks like the T1200XE it should come as no surprise that Toshiba sells more portable PCs than any other company in the world. After all, you're not the only one who recognizes a good thing when they see it.



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In Touch with Tomorrow

TOSHIBA

Circle 257 on reader service card

425TE, 433TE

Twin 486 EISA Towers Include Dell's First 33-MHz Server

Two 486 EISA towers are Dell's way of helping you gather your collection of office workers into a real work group. Both high-end servers come with clever design features: Expansion slots hold boards vertically, so heat rising from one board won't warm its busmates. The ports at the rear of the cards are conveniently located on the upper face of the tower along with system I/O ports—so you'll seldom need to get on your knees to hook or unhook cables to the server. And the top-face bay for ports and connectors is covered by a sliding, coffeeproof cover.

A four-character LCD on the front panel displays status and error messages during boot-up and makes troubleshooting a lot easier. The power switch and reset button are also located on the front panel. Moreover, you won't need a screwdriver to get inside: All the parts snap on and off.

Both machines feature the high-capacity EISA bus, which should help reduce or eliminate network bottlenecks. Dell maintains that the machines have been tested and found 100 percent compatible with every EISA network board it could find.

The 425TE runs at 25 MHz and omits a memory cache, since tests showed no performance improvement. The 433TE runs at 33 MHz and includes a 128K cache that Dell says bumps up performance 7 percent. In most other respects the machines are twins: Both ship with 4MB of RAM and provide 8 EISA slots and 11 drive bays (5 externally accessible) so you can pack in up to 64MB of RAM and 2GB of storage. Both also have a new ROM-based setup that includes several handy features, such as the ability to disable floppy boot. Both include a "smart," heat-sensitive fan: The hotter the machine gets, the faster the fan runs.

The basic system configuration includes a 3½-inch floppy drive and an 80MB hard drive, as well as a monochrome VGA monitor. Prices are $6749 for the 425TE and $8949 for the 433TE. —*Michael Goodwin*

IN BRIEF

Choose a fast or faster 486 network server from Dell and get a bundle of conveniences that make these towers easy to install and reconfigure.

Dell Computer Corp.
9505 Arboretum Blvd.
Austin, TX 78759-7299
800/426-5150
Reader service no. 746

Dell's 425TE (above) and 433TE EISA towers sport several clever design features that make them easier to install and configure, including a front-panel LCD that displays status and error messages during boot-up.

Dycam Model 1

A Digital Photo Finish for Your PC

Gray-scale scanners are fine for importing photographic images into your PC, but they won't take the picture for you. Now Dycam is offering a digital still camera that cuts out the middle scan. Half the cost of most 8-bit scanners, the Dycam Model 1 lets you take a picture of virtually anything and upload the image through your PC's serial port.

The $995 Model 1 is about the size of an instant camera and just as handy. Point and shoot; moments later a 376-by-240-pixel image appears on your screen in 256 levels of gray. You can slip the 7-by-3-by-1-inch shutter box into your pocket and take it on the road.

The Model 1 stores up to 32 images in memory for 24 to 48 hours on two AA nickel-cadmium batteries. To download images and/or recharge the batteries, simply snap the Model 1 back into its cradle and plug the cradle into your PC's serial port and any AC outlet.

Don't expect photographic controls; you can't manually adjust focus, shutter speed, or the intensity of the built-in flash, and there's no numeric picture counter. Audible beeps warn you when you've taken a bad picture and count down the number of remaining exposures after 26—five beeps if five exposures remain.

Dycam's software is also bare-bones. You can view each picture under *Windows 3.0* or save it as a TIFF file, previewing all the images at once via a proof sheet–like display on your computer. But if you want to crop, resize, or retouch images, you'll need to buy a darkroom-style package such as Astral Development's *Picture Publisher*. Each photo takes 90K but can be compressed using off-the-shelf archival software.

Viewing requires DOS version 3.0 or a later version, *Windows 3.0*, 1MB of RAM, and a hard disk. —*Daniel Tynan*

IN BRIEF

This pocket-sized digital camera lets you store black-and-white photos in your PC at half the price of a scanner.

Dycam Inc.
9546 Topanga Canyon Blvd.
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818/998-8008,
818/998-7951 (fax)
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—Grant Tipler, Manager, Corporate Banking, Head Office, The Royal Bank of Canada

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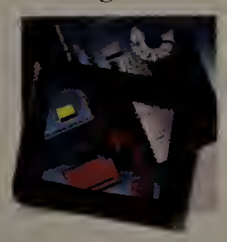
Lotus Agenda 2.0 is so easy to work with, you'll start getting better control of your professional life within 30 minutes.

Lotus Agenda



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With millions of different color shades produced by high-quality inkjet technology, the HP PaintJet printer family makes it easy for you to look brilliant.

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Of course, HP PaintJets are DOS and Macintosh compatible. Work with all your favorite graphics software. And print on transparencies as well as paper.

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GrandView 2.0

Information Manager Turns Outliner

You can view the once-trendy personal information manager (PIM) category in different ways: as the best hope for managing your work load, or as a catchall for the oddballs of the software world. Symantec would prefer that you take a *GrandView* and forget the package's earlier PIM label.

In version 2.0, Symantec reaffirms *GrandView*'s identity as a "text outliner," which is a better description of its structure. But the improvements amount to a passel of PIM-like tools—including column and calendar functions and a memory-resident option—to help you organize yourself and those around you.

As with version 1.0, you can use *GrandView* to simultaneously build documents and outlines by entering free-form text beneath headings and subheads, seeing only the detail you need. You can tackle simple project management, to-do lists, and schedules and track group projects.

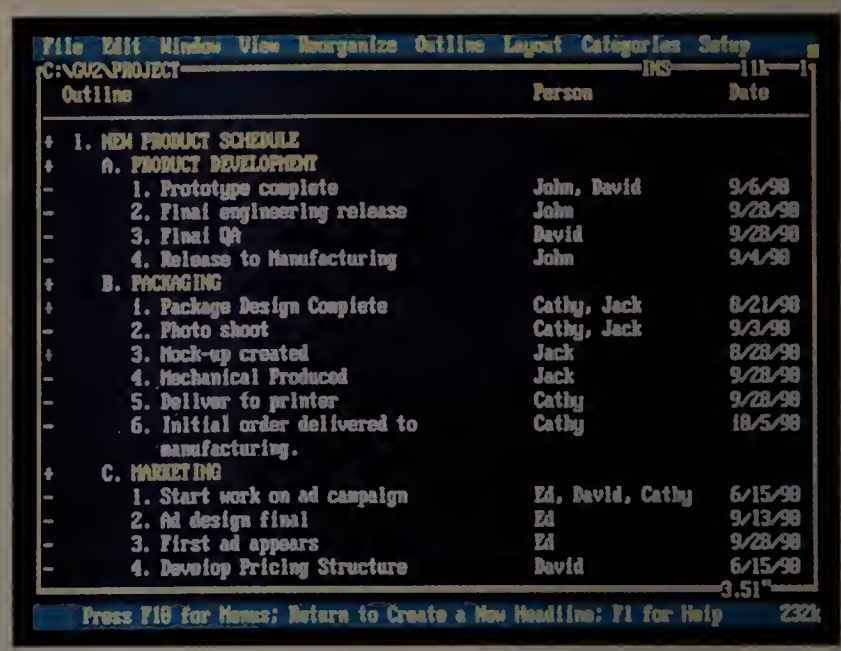
GrandView 2.0 provides new, easier ways to sort and view your schedules or projects. For example, you can create up to 22 categories for each document and arrange them in spreadsheetlike columns (although you can display or print only 3 at a time). *2.0*'s new calendar function makes it easy to juggle schedules and view or print lists of the people, tasks, or resources in a project by day, week, or month. But the package still lacks clock or alarm functions and an automatic way to schedule recurring events, such as weekly staff meetings.

Rudimentary file-locking and a handful of group-management features make *GrandView 2.0* good for networks. Link multiple outlines to one document on the network if, say, you want to hang individual to-do lists off a master work-group schedule.

GrandView 2.0 gains power as a desktop presentation tool with hooks to *Harvard Graphics* and *Freelance Plus*, letting you instantly turn outlines into a series of bulleted text charts. *GrandView* exchanges files directly with *WordPerfect*, but the new page previews, style sheets, and support for PostScript printers let you produce good-looking output without ever having to open your word processor.

GrandView 2.0 retails for $295; upgrades from earlier versions are $50.

GrandView 2.0 requires 320K and DOS 2.0 or a later version; a hard disk or expanded memory is required for the TSR option. —*Daniel Tynan*



Version 2.0 of GrandView, Symantec's text outliner, includes a bundle of PIM-like tools to help organize individuals and work groups.

IN BRIEF

This outliner/personal information manager adds a calendar, hooks to graphic programs, and other tools that aid both individuals and the work group.

Symantec Corp.
10201 Torre Ave.
Cupertino, CA
95014-2132
800/441-7234, 800/626-8847 California
Reader service no. 752

Force 386/33, Force 386X

Jumped-Up 386s

As top-of-the-line 386 machines get cheaper, 20-MHz and 25-MHz 386 models are getting squeezed out. Budget PC maven Packard Bell is dropping its 25-MHz offering from the lineup in favor of the Force 386X and Force 386/33.

Either way you jump, you get the usual Packard Bell bare-bones price with plenty of features on those bones. Configured as a decent *Windows* machine, the entry-level Force 386X comes with 2MB of memory (expandable to 8MB on the motherboard and 16MB overall) and a fast 124MB hard drive. You'll also find both 3½-inch and 5¼-inch floppies in this 16-inch-square, 16-MHz SX (which replaces a slightly larger SX model).

The drive controllers are on the motherboard, but you'll need to use one of its three 8/16-bit slots for an extended VGA card. The Force 386X lists for $4298 with a color monitor, but expect to find it at your local computer retailer for around $2200.

If you worry that service will go the way of those extra margin dollars, Packard Bell has bumped up its previous four-month, on-site service promise to a full year. DOS 4.01, *GW BASIC*, the *LotusWorks* integrated productivity package, and a $49 Prodigy software start-up kit are bundled in for free.

Step up to the Force 386/33, and you get the same software, repair policy, two floppies, and hard drive, plus 4MB of one-wait-state memory backed by a 35ns, 64K memory cache and eight expansion slots. You can add 4MB more to the motherboard, and each of the two 32-bit slots can hold a memory card with up to 16MB. Two of its five 8/16-bit slots are filled by an extended VGA card and a drive controller that will support two floppy and two hard drives.

With a color monitor, the list price on this configuration is $7387, but you can probably find the 386/33 at your local retailer for around $4000. —*Mark Henricks*

IN BRIEF

These cut-rate 386 and 386SX PCs give you the same big bundle of features at any speed.

Packard Bell Electronics
9425 Canoga Ave.
Chatsworth, CA 91311
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Reader service no. 692

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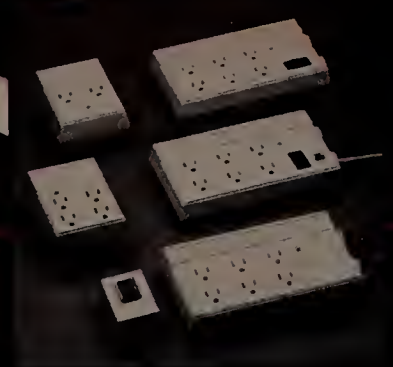

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Circle 11 on reader service card

3" x 8" x 11"

THE BRICK™

The fastest 386SX™ with 212 MB HD, 8 MB RAM, 1024 x 768 VGA, and a built-in modem weighs just 8.7 lbs.!

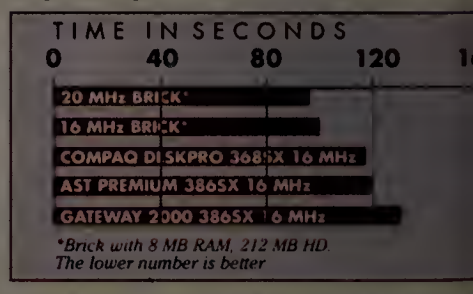
This new generation PC is remarkable for the performance and the practicality it provides. The Brick is powerful enough for the most demanding applications, while its elegance, quietness and size make traditional PC's seem downright obtrusive by comparison.

More Practical Than a Portable

For multisite computing, the Brick offers an alternative to the usual trade-offs of laptops or multiple PC's. Just keep your preferred keyboard and full size monitor, plus power supply at your regular destinations and carry only the 8 lb. Brick in between. You'll save half the cost, half the weight and all the hassle of coordinating files between multiple machines.

Blazingly Fast

Compared to published reports of **all** 386SX machines tested to date by *PC Magazine* and *Byte*, the Brick offers superior performance on the



Time to complete PC Magazine full benchmark test set.

"A Tote-able that Outperforms the Desktops...

Consistently outperforms both Compaq's and IBM's 386SX on the PC Labs computer benchmark tests...Ergo's Brick maintains the functionality of a Desktop PC within a small form factor"

— PC MAGAZINE, Sept. 1990

Fits in half a briefcase, leaving room for full-sized folders, notebooks, etc.

aggregate of system, video and hard disk benchmarks.

Massive Hard Disk

Bricks are available with 16 or 20 MHz 386SX, 1-8 MB of RAM, a fast 44, 104 or 212 MB Conner or Teac IDE hard disk, and a 387 coprocessor socket. A 2,400 bps Hayes compatible modem is standard.

The fast VGA graphics feature up to 1024 x 768 non interlaced resolution with a full 1 MB of video memory. In fact, the Brick's video performance is twice as fast as the average of 42 386SX systems tested by *PC Magazine!* This makes an enormous difference in the perceived "response" of the system, especially if you're running graphically intensive applications like Windows or Desktop Publishing.

Surprisingly Expandable

The Brick is only about the size of a ream of copier paper, yet you can still add up to two ISA half cards internally, (one card with a floppy drive). A docking port allows easy, drop-in connection to our Docking Terminal, ($249, available Q1 1991) which instantly hooks up all cables and provides another 16-bit 3/4 length slot. The "stretch" version of the Brick accommodates full length cards.

Optional back-lit VGA super twist LCD display.

Totally Versatile

When you need to travel, just add the optional VGA LCD module, ($895, available Q1 1991) and our Brick Bag for a completely self- contained, AC powered portable system.

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Because we are a direct selling manufacturer, we have a direct interest in the complete satisfaction of each and every customer. To ensure that satisfaction, **Ergo** offers: a 30-day money back guarantee, a One Year Warranty, unlimited 800-line support and our exclusive Advanced Diagnostics via modem.

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You'll find complete information on all Brick systems, plus a full complement of enhancements including monitors, tape backup units, external 5.25" floppies, cases, FAX and network boards and more in our free 32-page catalog. Ergo also offers "traditional" 386 and 486 computers from 16 to 33 MHz, starting at just $1,895.

Order your Brick today, Factory-Direct! Call us at **1-800-633-1925** (or 508-535-7510) and we'll help select the system that best meets your needs.

$2,495

Includes

- ▲ 16 MHz Intel 386SX
- ▲ 1 MB RAM, Exp. to 8 MB
- ▲ 44 MB hard disk with password protection
- ▲ 16-bit half card exp. slot

Standard Features

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- ▲ 2,400 bps modem
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Circle 64 on reader service card

Personal Color Scanner, UC300

Low-Cost Scanners Take You Beyond Black and White

Howtek's Personal Color Scanner and UMAX's UC300 can capture up to 256 gray shades or 16 million colors per image, and both offer incrementally adjustable resolutions of up to 300 dots per inch.

Desktop publishing on the PC has traditionally been a black-and-white affair. That's no surprise: Scanning, storing, and printing high-quality color images is expensive. Now affordable color scanners from Howtek and UMAX Technologies help solve the input part of the color conundrum.

Howtek's Personal Color Scanner and UMAX's UC300 can capture up to 256 gray shades or 16 million colors per image, letting you grab color as well as black-and-white images. You must still shell out for storage space—30MB for a single full-page color image. As for output, you may want to wait for 300-dpi color printers to become more affordable.

At $1995, the Personal Color Scanner is the cheapest color/gray-scale unit yet. It comes with Howtek's *Scan-It* software, which provides basic image-manipulation functions: cropping, resizing, and adjusting color range and intensity.

Like Epson's ES300C color/gray-scale scanner, the UMAX UC300 costs $2495 and comes with *Picture Publisher Plus*, the color version of Astral Development's sophisticated darkroom package.

Both flatbed scanners offer incrementally adjustable resolutions up to 300 dpi and feature line-art and halftone scan modes as well as gray scale and color. .Maximum image size is 8½ by 14 inches. Both feature proprietary three-pass scanning engines, but neither emulates other popular gray-scale scanners, not even the HP ScanJet Plus.

Howtek's *Scan-It* requires DOS 3.0 or a later version and 512K of RAM for a 640 by 480 video adapter, 2.5MB of RAM for a 1024 by 768 adapter. UMAX's *Picture Publisher Plus* requires *Windows 2.1* or *3.0* and 640K. —*Daniel Tynan*

IN BRIEF

Howtek and UMAX scanners bring affordable color images into your PC, even if the cost of storing and printing them remains high.

Howtek Inc.
21 Park Ave.
Hudson, NH 03051
603/882-5200,
603/880-3843 (fax)
Reader service no. 749

UMAX Technologies
2352 Walsh Ave.
Santa Clara, CA 95051
800/562-0311,
408/982-0771,
408/982-0776 (fax)
Reader service no. 750

Little Big LAN, The $25 Network

Bargain-Basement LANs Big and Small

Want to connect PCs for peanuts? Information Modes proffers two products, both at breakthrough prices: *Little Big LAN*, a peer-to-peer network operating system like *LANtastic* or *LANsmart;* and *The $25 Network*, which lets a few PCs share files and printers over serial cables.

Little Big LAN covers the whole range of standard peer-to-peer networking features. Users can share drives, printers, applications, and data files and run multiuser LAN applications. A simple pop-up messaging program is included, or you can run electronic mail programs like *cc:Mail* or *DaVinci* instead. *Little Big LAN* will link as many as 254 workstations over common Ethernet or Arcnet systems, or about 10 PCs using serial or parallel cables, or even modems. In marked contrast to major peer-to-peer LANs like *LANtastic* and *TOPS*, which require you to buy a separate copy of the operating system for each PC, one copy of *Little Big LAN* per network is all you need.

The $25 Network is a simpler product that links PCs via serial cables only. Its features are similar to *Little Big LAN*'s, but *The $25 Network* doesn't support DOS file locking—which means trouble if two users try to edit the same file. While you can easily run a program stored on another user's PC, you may be better off storing it on your own disk, because applications that swap code in and out of memory via overlay files (like *WordPerfect* or *Quattro*) will run unacceptably slow. (Network boards are up to nine times faster than the fastest serial-port transfer.)

The $25 Network has several advantages over its competitors. Unlike *LANtastic Z*, which connects only two PCs, the program is limited only by the number of serial ports you can fit in a hub PC. And unlike Traveling Software's *DeskLink*, it doesn't tie up your PC while someone else uses its files or printer.

Little Big LAN costs $75 per LAN; *The $25 Network* costs $25 for the first LAN, $12.50 for each additional LAN at the same location. All prices include unlimited telephone support. A null-modem serial cable for either program costs $15 for the first 10 feet, 25 cents for each additional foot. —*Robert Lauriston*

IN BRIEF

Little Big LAN is a full-featured peer-to-peer LAN, while *The $25 Network* is a simple serial network. Either can be had for peanuts.

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Reader service no. 747

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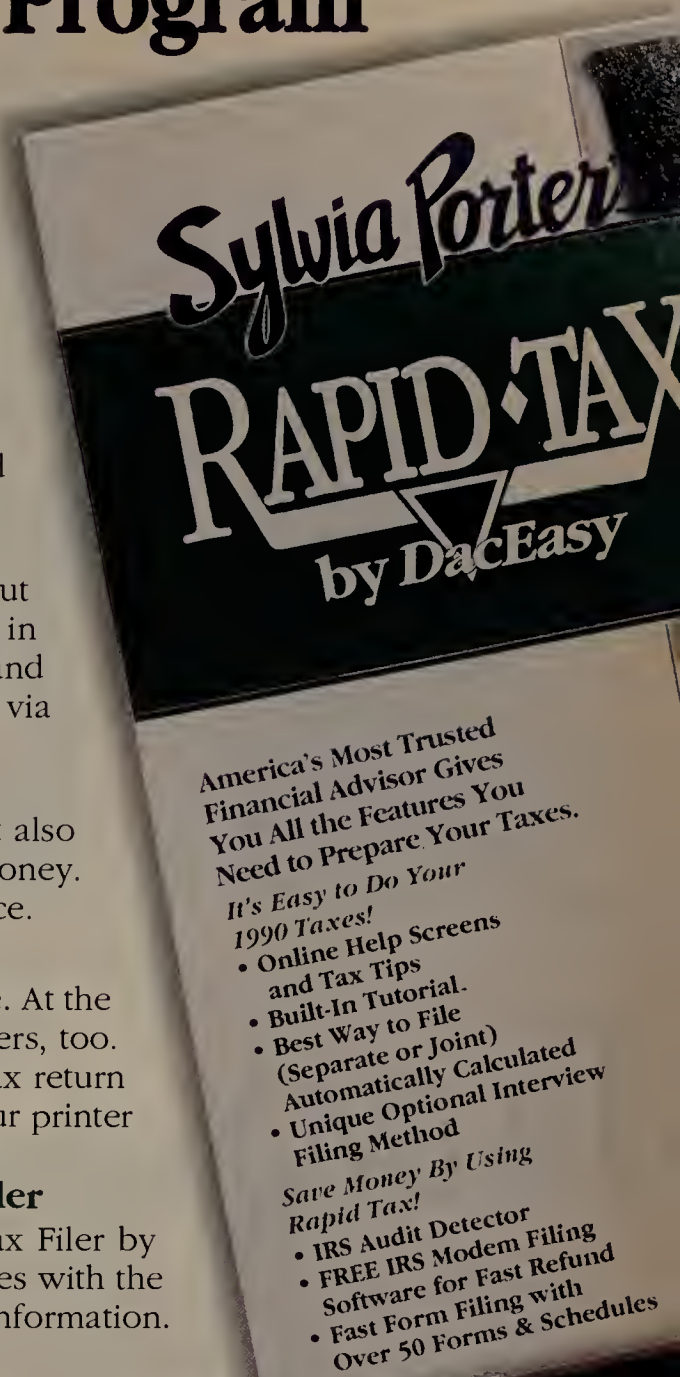
It's easy to file your State Taxes when you use the RapidTax Regional State Tax Filer by DacEasy. Sold separately through DacEasy for only $49.95, this program interfaces with the Federal RapidTax program making state tax filing simple. Call DacEasy for more information.



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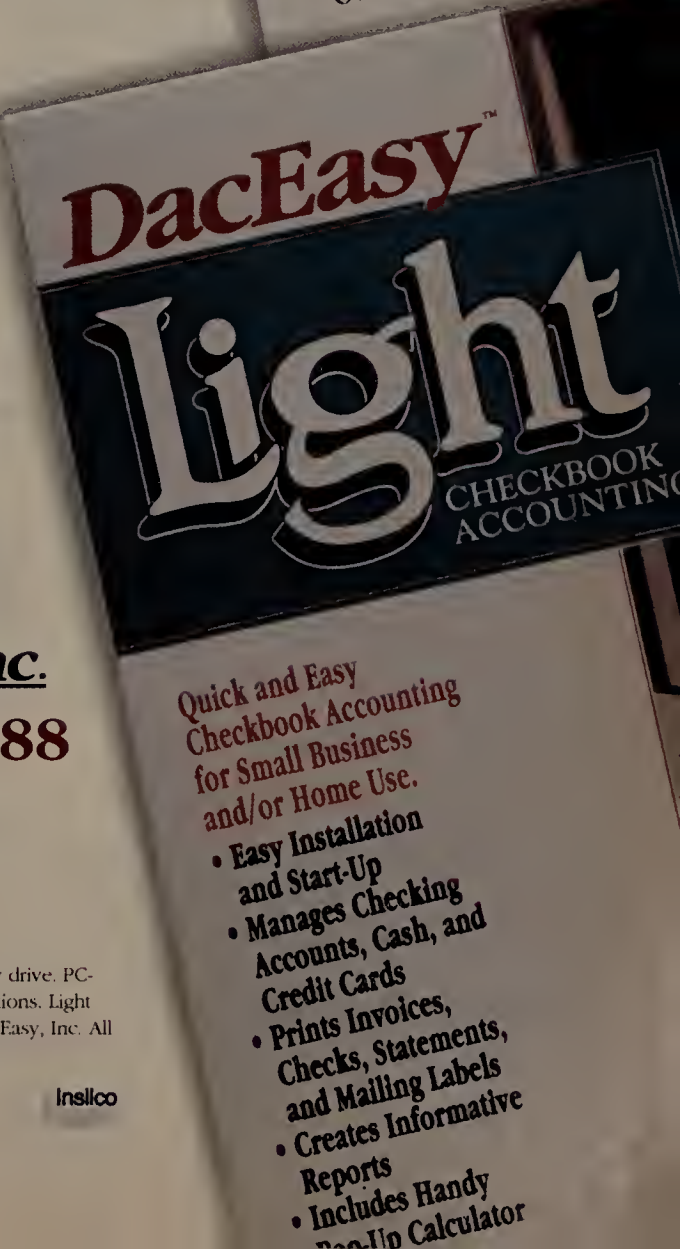

Minimum Hardware Requirements: Sylvia Porter's RapidTax requires 512K memory. IBM or compatibles. One hard drive and one floppy drive. PC-DOS or MS-DOS 2.1 or higher. 80 column printer. For use in U.S. only. IBM, PC-DOS and MS-DOS are trademarks of their respective corporations. Light and RapidTax are trademarks of DacEasy, Inc. • 17950 Preston Rd. • Suite 800, Dallas, TX • 75252. • 1-800-877-8088 © Copyright 1990 DacEasy, Inc. All rights reserved.

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Insilco

Circle 94 on reader service card

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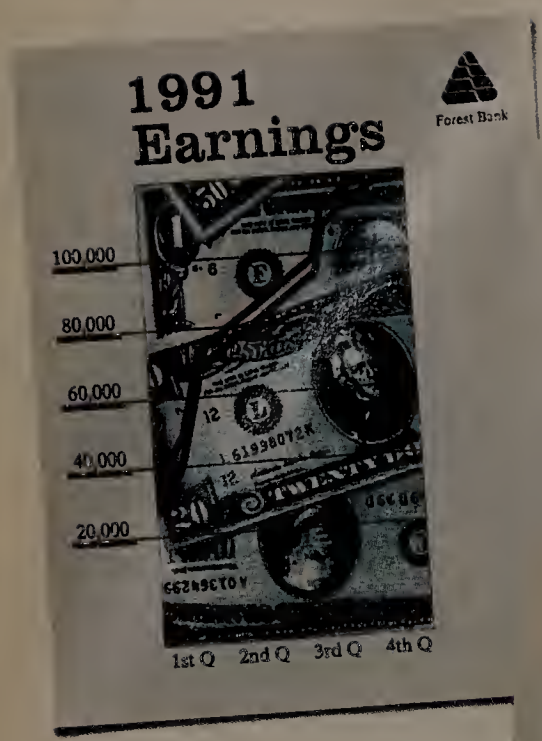

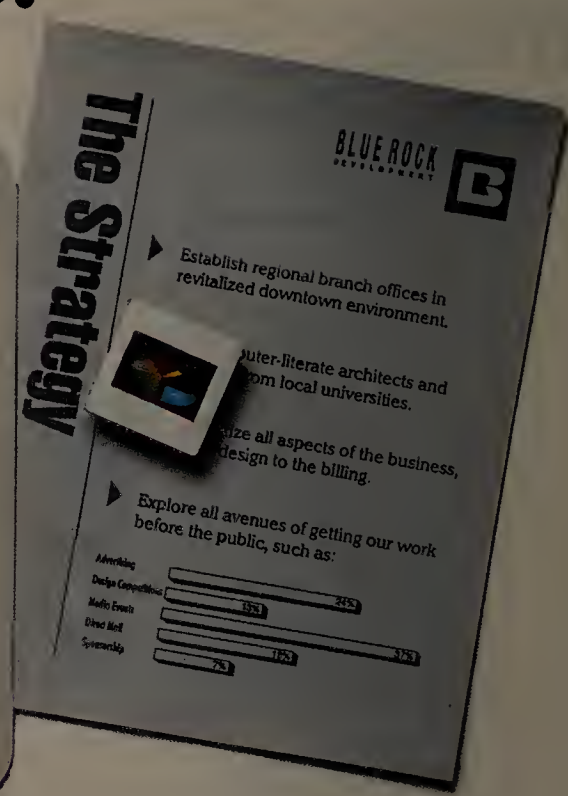

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We found APPLAUSE II to be easier to work with than either Harvard Graphics or Freelance Plus, and faster than the Windows-based products.

INFOWORLD
JUNE 11, 1990

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PC MAGAZINE MARCH 13, 1990

PC/COMPUTING APRIL 1, 1990

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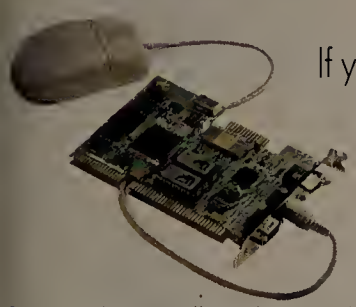
VGAWONDER+ FASTER THAN VRAM



If you're about to buy a graphics card, make sure you don't get fleeced. And if anyone tells you that VRAM is the fastest, he's pulling the wool over your eyes. VGA*WONDER+** what ewe...er...you need.

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Circle 302 on reader service card

PM9600SA V.32/V.42bis, 9600EX

9600-bps Throughput Made Affordable

For years, the prices of high-speed modems have been up in the treetops. But now that V.32 has edged out proprietary schemes to become the 9600-bps data-transfer standard, prices are sliding earthward.

Practical Peripheral's PM9600SA V.32/V.42bis stands at the forefront of the conspicuously budget priced. It sells for a reasonable $699, about $500 less than its pay-for-the-name peers.

In addition to supporting V.32, the PM9600SA offers both MNP-5 and V.42bis error correction and data compression. That means you'll be able to swap error-checked, compressed files at any of the standard modem speeds, limited only by the capabilities of the modem on the other end. Configured properly, the modem can shuttle data at an effective throughput of 38,400 bps—but only with ideal file types under ideal circumstances.

Front-panel buttons let you switch on power and even get the modem to answer the phone. Among other things, status lights tell you the speed at which the modem is communicating with the PC's serial port and what error-correction mode—MNP or V.42bis—is in use. You control speaker volume using software, and the PM9600SA comes with a five-year warranty.

For a somewhat heftier price, Intel's V.32 modem, the 9600EX, has an equally impressive feature set and a five-year warranty. At $799, you get the same V.42bis and MNP-5 support and the same top effective throughput of 38,400 bps. It too has front-panel indicator lights, including ones to signal use of error-correction and 9600 bps. However, the Intel's power switch and volume knob are in the back.

It comes with a copy of *Communications by Crosstalk*, a simplified version of DCA's *Crosstalk Mk. 4*, and like its rival is Hayes compatible, so it can speak to any 2400-bps modem. —*Judy Heim*

IN BRIEF

Now that 9600-bps modem standards have settled down, you can boost throughput dramatically for not much more than you'd pay for a brand name 2400-bps modem.

Practical Peripherals
31245 La Baya Dr.
Westlake Village, CA 91362
800/442-4774,
818/706-2474 (fax)
Reader service no. 744

Intel Personal Computer Enhancement Operation
5200 N.E. Elam Young Pkwy.
Mail Stop CO3-07
Hillsboro, OR 97124
800/538-3373
Reader service no. 745

Practical Peripherals' PM9600 SA (above) and Intel PCEO's 9600EX are budget-priced 9600-bps modems with MNP-5 and V.42bis error correction and data compression for effective throughput of up to 38,400 bps.

ImPort for Windows

Windows Graphics Bridge Is Created From DOS Presentation Packages

Got a library of *Harvard Graphics*, *Lotus Freelance*, or other DOS images you'd rather see in *Windows 3.0? ImPort for Windows* will translate a slew of graphics formats into the *Windows* Clipboard, from which they can be cut and pasted into Micrografx's *Designer*, Aldus's *PageMaker*, or other powerful *Windows* applications.

A *Windows*-capable version of Zenographics' DOS-based graphics importer, *ImPort for Windows* supports *AutoShade* RND, *Harvard Graphics*, *Lotus Freelance*, HPGL, PIC, SCODL, CGM, and *AutoCAD*'s ADI, SLD, and DXF formats. Unlike some of Zenographics' DOS translators, *ImPort for Windows* won't convert rasterized formats, which means it won't help you translate TARGA and PCX files.

The $195 *ImPort for Windows* is limited to CGM or *Windows* Metafiles output, but these give you some appealing options. For example, you can use a DXF image in your *Corel Draw* slide show and then print to any *Windows* printer along the way. Another helpful feature, which the earlier *Metafile 3.0* lacked, is the ability to map fonts into your file formats. That DXF file-turned-slide can now have, for example, Helvetica bold titles.

ImPort for Windows requires 640K of memory and a hard drive; the program works with *Windows 2.xx* or *3.0*. —*Mark Henricks*

IN BRIEF

You can move a slew of DOS graphics formats into your Windows applications, bringing along fonts as well.

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714/851-1314 (fax)
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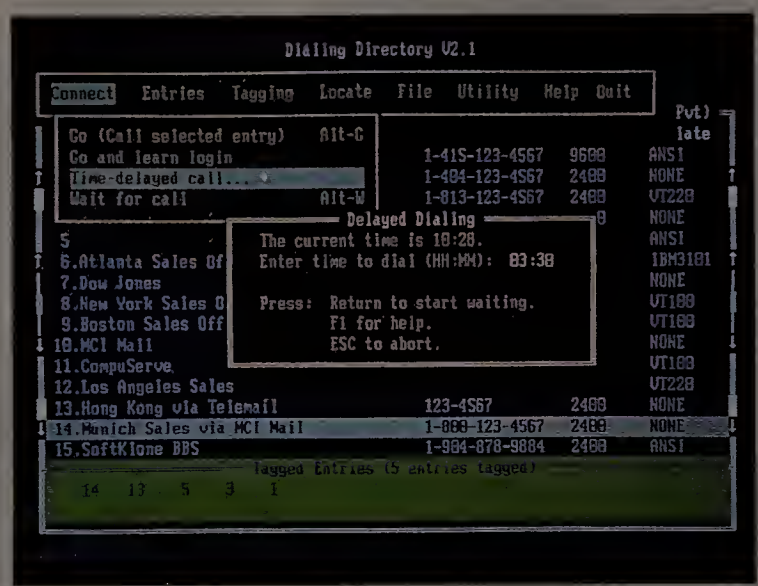
Mirror III 2.0



Version 2.0 of Mirror III has a dialing directory interface.

In an effort to ease communication sessions and speed data transfer, SoftKlone has given version 2.0 of *Mirror III* a dialing directory interface with pulldown menus and mouse support, as well as support for more data transfer protocols. The $149 communications program gains support of ZMODEM, XMODEM, and an emulation of the MNP-5 error-correction/data-compression protocol. Upgrades are $49. SoftKlone, 327 Office Plaza Dr. #100, Tallahassee, FL 32301; 800/634-8670, 904/877-9763 (fax).

Reader service no. 768

Ami 1.2

Version 1.2 of *Ami*, Samna's *Windows* word processor for the casual user, gains speed as well as compatibility with *Windows 3.0*. There's also a bundle of new features, led off by limited versions of the mail merge and macro recording found in *Ami Professional*. Other additions to *1.2* such as automatic footnoting, nonprinting of notes, and an enhanced set of import/export filters are also the equivalents of features in *Ami Professional*. *Ami 1.2* retails for $199; registered users of the previous version may upgrade for $49.95. The software requires a 286-based computer with DOS 3.0 or a later version, 640K of RAM, at least a Hercules or CGA graphics adapter, and a hard disk. Samna Corp., 5600 Glenridge Dr., Atlanta, GA 30342; 800/831-9679, 404/255-9460 (fax).

Reader service no. 763

BASIC Professional Development System 7.1

In an effort to bring it up to par with C development tools, Microsoft has enhanced the data base engine, debugger, and programming editor of its *BASIC Professional Development System*. *BASIC PDS 7.1* gains version 3.1 of the popular CodeView debugger. Its Indexed Sequential Access Method data base engine has been enhanced to run faster than Novell's Btrieve tool or Fox Software's *FoxPro*, claims Microsoft. The $495 version 7.1 requires either DOS 3.0 with a hard disk and 640K of RAM (EMS 4.0 memory is recommended as well) or OS/2 1.1. The upgrade from *BASIC PDS 7.0* is $50, while upgrades from earlier versions cost $195. Microsoft Corp., One Microsoft Way, Redmond, WA 98052-6399; 800/426-9400.

Reader service no. 764

Sylvia Porter's RapidTax

DacEasy *RapidTax* has been converted to *Sylvia Porter's RapidTax*, gaining both IRS instructions in simple English and tax tips from the popular financial columnist. The package includes a new interface with pulldown menus, electronic filing capability, and a function that will detect when an entry exceeds historical IRS guidelines and may trigger an audit. *Sylvia Porter's RapidTax* requires DOS 2.1 or a later version and 512K of RAM. It sells for $79.95; state versions are an additional $49.95. DacEasy, Inc., 17950 Preston Rd. #800, Dallas, TX 75252; 800/877-8088, 214/250-3752 (fax).

Reader service no. 766

Microsoft Word for Windows 1.1

Version 1.1 of *Microsoft's Word for Windows* incorporates the new 3-D look of *Windows 3.0* but, more important, adds new file conversion and macro recording capabilities. *Word for Windows* gains color PCX and HPGL file filters. Moreover, it's now easier to read files from *Word for the Macintosh* and to export files to the character-based *Word 5.0*. Mail merge and paragraph-shading macros also have been added. Updates to the $495 product are a mere $7.50 for owners of version 1.0 and $150 for users of character-based *Microsoft Word*. It requires a 286-based computer with 1MB of memory, a graphics card, a hard disk, and *Windows 2.11* or a later version. Microsoft Corp., One Microsoft Way, Redmond, WA 98052-6399; 800/426-9400.

Reader service no. 765

Bernoulli Transportable, Portable, Dual

Iomega has increased the features and lowered the prices on its Bernoulli storage options and made each compatible across DOS, OS/2, and Macintosh platforms. The price of the 14-pound Bernoulli Transportable has been reduced to $1399. The new Bernoulli Portable, whose 2½-hour nickel-cadmium battery adds another 2 pounds, costs $1699. Both Portable and Transportable have the same new slim-line form factor and 22ms average access speed and share the same 44MB cassettes. Iomega Corp., 1821 W. 4000 S, Roy, Utah, 84067; 800/456-5522.

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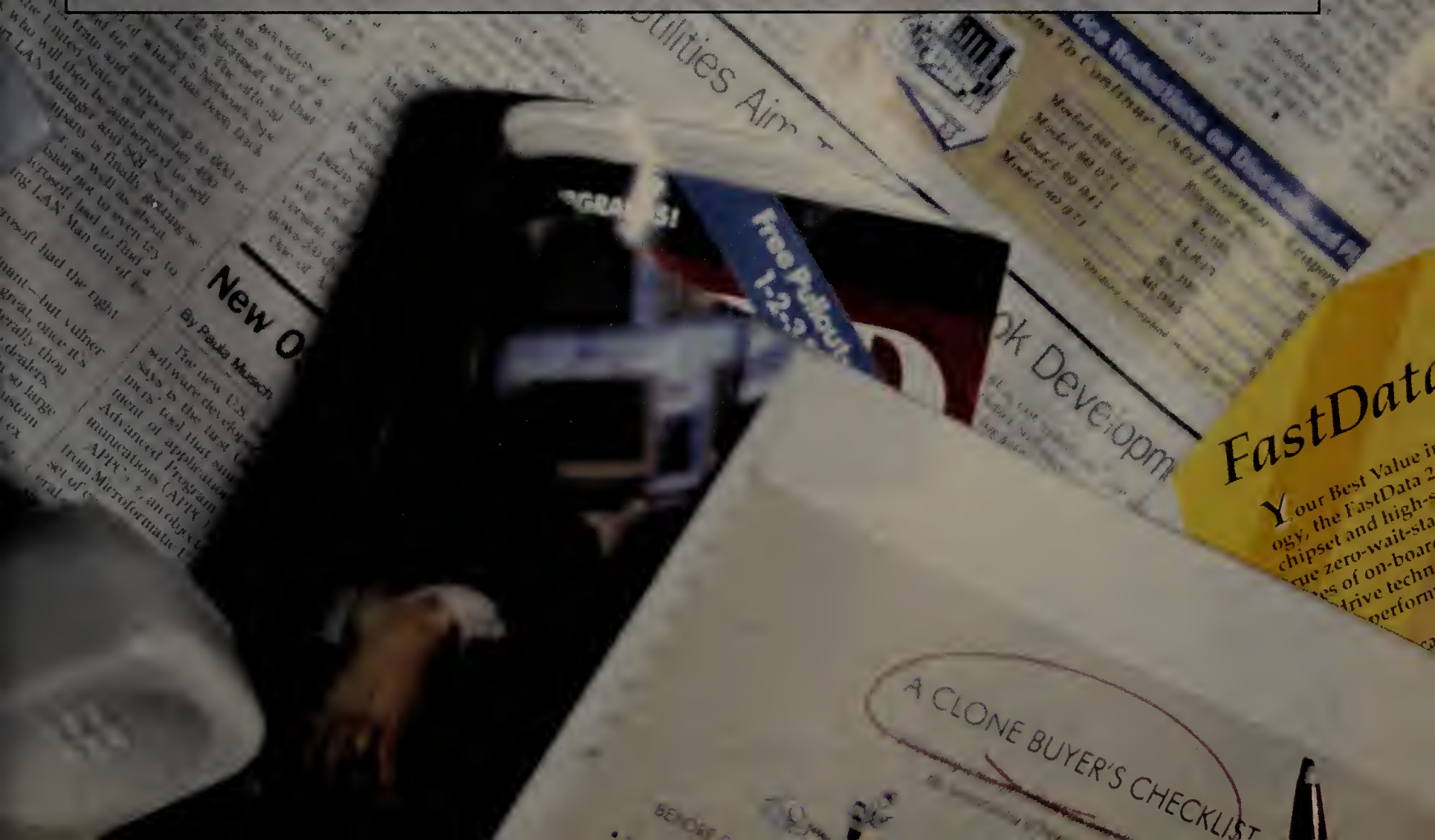
For more information about any product, contact the manufacturer or circle the number on the reader service card.

When choosing a personal computer, there are two questions you should ask.



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A personal computer is a large investment; before you choose, we want you to know what to expect when you purchase a FastData personal computer from FastMicro.

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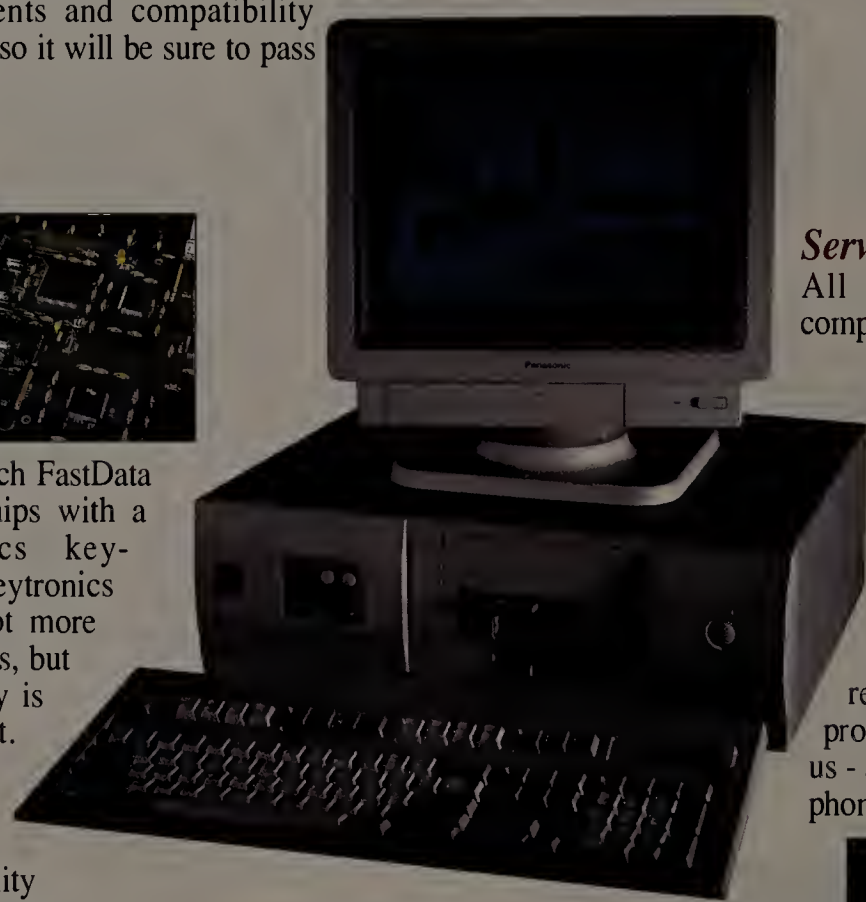
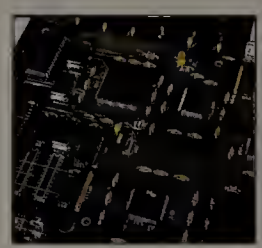
You get more out of your FastData personal computer because we put more into it. We've been building PC's longer than most of the competition and we put that experience to work for you. We use proven designs that pass our stringent performance requirements and compatibility standards so it will be sure to pass yours.

Full Support.

Our team is standing by and ready to make your FastData computer perform to its greatest potential for you. When you buy a FastData computer, you're covered by Toll-Free technical support for life. And since we sell more software than other computer companies, we are uniquely qualified to give the proper support the customer deserves.



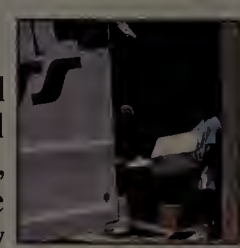
Better Components.



The whole is only as good as the sum of its parts; and FastData systems use some of the best parts in the industry. For example, each FastData system ships with a Keytronics keyboard; Keytronics costs a lot more than others, but the quality is worth it.

Our systems use exclusively Toshiba floppy drives, the industry leader. Standard equipment includes other quality components from Western Digital, Phoenix, Chips & Technologies, just to name a few.

Service.



All FastData personal computers come with a full one year warranty, but that's just the start. In the unlikely event your computer is down, it is our goal to get back up and working as quickly as possible - and we back it up with action. Call us toll-free and we'll work with you to determine the problem; if a part breaks, we will send you the replacement part through our FastSHIP program - before the broken part is returned to us - and we'll pay the freight both ways. If our phone support or FastSHIP program can't solve your problem, we will service it on-site to most U.S. locations or replace your computer at no charge. Now that's service.

Selection.

Our face to face retail background has made us never forget that the customer comes first and that a personal computer is just part of a customer's overall needs. That's why FastMicro offers thousands of hardware and software products to enhance your new personal computer. In fact, our competition will probably tell you to call us when you need something to run on their personal computer.

Risk Free.

We pass the test for the choosiest of customers; in fact, FastMicro sells to over half of the Fortune 500 and Universities in 47 states (we're working on the rest). These people buy for a living and rely on us, you can too. You can do more than take our word on it - go ahead and purchase any FastData brand product from FastMicro and if you are not thoroughly satisfied after 30 days, you can return it for a full refund of the purchase price.

Circle 100 on reader service card

Which FastData?

$1599 FastData 386/SX

Combine the benefits of an advanced Intel 386 processor, the value of a 286 and the advantages of FastData and you've got the FastData 386/SX! This machine is the choice of those who want to run today's powerful 386 and multitasking software, like Windows, and want to rip through their favorite programs, like Lotus and WordPerfect at blinding speeds. This machine is ideal to run the latest memory demanding and graphic software, right out of the box. We've made our customers' favorite options standard: it comes with an ample two megabytes of memory, a high performance 40mb hard drive, and 16 bit color VGA. Compare performance, features, and service and you will find no better SX value. Interested further? Try the FastData 386/SX for 30 days; you have to be happy - if not, we'll take it back.

Standard Features

- ✓ 16mhz Intel 80386-SX processor. (20mhz optional)
- ✓ 2 megabytes of zero wait-state RAM.
- ✓ 40 mb 28ms IDE hard disk, 1:1 interleave.
- ✓ 1.2mb 5.25" or 1.44mb 3.5" floppy drive. (Second drive add $79)
- ✓ Standard chassis with keylock, speed and reset buttons. (Optional chassis add $50)
- ✓ Five available drive bays.
- ✓ 200 watt power supply
- ✓ 14" VGA color monitor with 16 bit VGA card with 256K.
- ✓ Clock calendar, parallel port, and two serial ports. (Game port included on color systems)
- ✓ Keytronics 101 key keyboard.
- ✓ 8 expansion slots, 5 available.
- ✓ 80387-SX coprocessor socket.
- ✓ Full Shadow RAM and LIM 4.0 EMS support.
- ✓ Phoenix BIOS.
- ✓ Compatible with DOS, OS/2, Windows, Xenix and Novell.
- ✓ FCC Class B approved.

System Price	40mb	65mb	80mb	100mb
Monochrome	$1,269	$1,369	$1,519	$1,619
VGA Color	$1,599	$1,699	$1,849	$1,949
VGA 1024	$1,749	$1,849	$1,999	$2,099

FastData 386/25 $2299

The optimum combination of features, expandability, and power make the FastData 386/25 an ideal choice for those whose applications demand the most from a computer. Whether running as a network fileserver, CAD or graphics station, or power-user's workhorse, the FastData 386/25 handily meets the challenge. It comes configured with a whopping four megabytes of fast RAM, a superfast 22 millisecond 65 megabyte hard disk, and maximum VGA displaying 1024 by 768 resolution powered by a high-output 16 bit 512K VGA board. Plus, the FastMicro team will configure your FastData 386 exactly the way you want, without sending you shopping elsewhere. When evaluating 386-DX workstations, why even consider anything else?

Standard Features

- ✓ 25mhz Intel 80386-DX processor. (33mhz optional)
- ✓ 4 megabytes of zero wait-state RAM.
- ✓ 65 mb 22ms RLL hard disk, 1:1 interleave.
- ✓ 1.2mb 5.25" or 1.44mb 3.5" floppy drive. (Second drive add $79)
- ✓ Standard chassis with keylock, speed and reset buttons.
- ✓ Five available drive bays.
- ✓ 80387-DX coprocessor socket.
- ✓ 200 watt power supply
- ✓ 14" Super VGA color monitor, 1024x768 resolution, with 16 bit VGA card with 512K.
- ✓ Clock calendar, parallel port, and two serial ports. (Game port included on color systems)
- ✓ Keytronics 101 key keyboard.
- ✓ 8 expansion slots, 5 available.
- ✓ Full Shadow RAM and LIM 4.0 EMS support.
- ✓ Phoenix BIOS.
- ✓ Compatible with DOS, OS/2, Windows, Xenix and Novell.
- ✓ FCC Class B approved.

System Price	65mb	80mb	100mb	200mb
Monochrome	$1,819	$1,969	$2,069	$2,469
VGA Color	$2,149	$2,299	$2,399	$2,799
VGA 1024	$2,299	$2,449	$2,549	$2,949

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Hardware

PRINTERS

ALPS Allegro 500 309
Citizen
200GX 189
GSX140 285

Citizen GSX140 $285

Loaded with features, this 24 pin printer is a hot seller! It comes with 6 resident fonts, paper parking, and Epson & IBM printing modes. It does up to 192 CPS and has a unique LCD control panel that lets you set everything without DIP switches. Upgrade to color anytime for just $39.

Diconix 150 Plus 329
Fujitsu
DL3400 419
NEC
P2200XE 259
P6200 479
P6300 639
LC290 2495
Okidata
182 Turbo 225
320 (IBM) 335
390 (IBM) 469
393 (IBM) 999
Panasonic
KXP1180 175
KXP1191 239
KXP1124 299
KXP1624 429
KXP4420 Laser 995
KXP4450/4455 Lasers ..... Call
Seiko Smart Label Printer 179
Star
NX1000-II 167
NX2410 279
XB2410 / 2415 ..... 429 / 569
Texas Instruments Microlaser PS 1839

MONITORS

Mitsubishi
1410 EGA 325
Diamond Scan 1381 479
NEC
Multisync 2a 469
Multisync GS 2a 205
Multisync 3d 629
Multisync 4d 1095
Panasonic
C1381 VGA 1024x768 new! 439

Panasonic Super VGA $439

The Panasonic C1381 will do VGA up to 1024x768 interlaced resolution. It has a dot pitch of .28 and is compatible with all standard VGA cards. Includes swivel base and VGA cable.

Princeton
Max15 237
Ultrasync 12" 479
Ultrasync 14" (now 1024x768) 509
Ultra 16 835
Samsung ..... Call
Seiko
CM1440 519
CM1450 659
Sony 1304 Multiscan 669
Zenith 1492 ..... Call

BOARDS

ATI
2400 ETC Internal 147
2400 ETC External 187
VGA Wonder 256 209
VGA Wonder 512 239
Brown Wagh Sound Blaster 157
Everex
1200B Int Modem 55
2400B Int Modem 105
EGA 480 Card 79
RAM3000 16 bit RAM card 75
RAM8000 16 bit RAM card 169
Hercules Graphic Card + ... 169
Intel
8087-2 115
287XL *New!* 209
387-DX20 369
387-SX16 319
Logitech ScanMan Plus 165

ScanMan Plus by Logitech $165

The perfect companion to popular desktop publishing software, the ScanMan Plus comes with PaintShow Plus editing software. It scans from 100 to 400 DPI and up to four inches wide. Add just $139, and CatchWord OCR software will let your ScanMan actually read text!

Orchid
ProDesigner 229
ProDesigner II 512/1mb 299/349
Tiny Turbo 286 207
Tiny Turbo Xtra 267
Paradise
Basic VGA - 8 bit 109
VGA 1024 256K 175
VGA 1024 512K 229

Paradise VGA 1024 $175

The 16-bit VGA 1024 comes standard with 256K and is expandable to 512K & will do up to 256 colors. It does up to 1024x768 interlaced, is compatible with EGA & CGA software, & comes with drivers for most major software. Free Indiana Jones 256 color game included (while supplies last).

Practical Peripherals
1200B Int Modem 59
2400B Int Modem 125
2400B Int with MNP 169
Prometheus
Promodem 1200B Internal 48
Promodem 2400B Internal. 98
Promodem 2400B Mini-Pocket 119
Promodem 2400G External 149
The Complete PC
Answering Machine 239
Fax 4800 229
Hand Scanner 400 139
Tiara Networking
Lancard/A PC (Arcnet) 79
Lancard/E Star 8 (Ethernet) 139
Lancard/E AT (16 bit Ethernet) 249
USRobotics
2400 Baud Internal 119
2400 Baud External 149
Courier HST 14,400 Ext. 579
Courier HST 14,400 Int. 539

BOARDS, continued

Video 7
VGA 1024i 256K 209
VGA 1024i 512K 237
Vega VGA 149
V-RAM VGA 512K 355
Western Digital Controllers
WD1006V-MM2 MFM AT 1:1 99
WD1006V-SR2 RRL AT 1:1 129
WE1007V-SE2 ESDI AT 1:1 199

FastData Products

FastData 16 Bit VGA

The FastData 16 bit VGA card features 256K of video memory, does CGA, EGA, & VGA up to 1024x768. Its expandable to 512K and comes with a 30 day money-back guarantee.

$99 256K Vers.
$129 512K Vers.

FastData CGA Card 35
FastData MGP Card 35

FastData 2400 Baud Internal Modem

$69 The FastData 2400 baud internal modem is fully Hayes compatible and can be configured to COM port 1-4. It has an internal speaker, is auto answer & auto dial, and comes with BitCom software.

Parallel/Dual Serial/Game Card 35
XT 1.44 Dual Floppy Controller 35

FastData Monitors

Your best value, we have a completeline made for us by leading manufacturers like Samsung & Hyundai. Like all FastData products, you have a full 30 day money back guarantee. Shown is the VGA Color for $319.

FastData Monitors
12" Amber Monochrome 79
14" Amber Monochrome 119
14" White Monochrome 119
14" White VGA Monochrome 129
14" CGA Color .52 dot pitch 199
14" VGA Color .31 dot pitch 319
14" Super VGA 1024 x 768i .28 dp. 399

DISK DRIVES

Colorado 40-120mb Int. Tape 249
Conner ..... Call
Mitsubishi
60MB AT RLL MR535 269

Mitsubishi 65mb AT Kit $349

RLL encoding, 1:1 controller, and 22ms access time make this a very fast performer. The perfect upgrade for your 286 or 386 compatible, this kit comes with everything you need including controller and cables.

Seagate
20MB XT Kit #225 239
30MB XT Kit #238 249
40MB AT #251-1 299
Toshiba
360K Floppy 69
720K 3.5" Floppy 69
1.2MB 5.25" Floppy 79
1.44MB 3.5" Floppy 79

Toshiba 1.44mb Floppy Drive $79

Complete with mounting brackets and installation instructions, this Toshiba works in all true 286 & 386 compatibles. Will also read/write/format 720K 3.5" disks. Rails, add $5.

POWER PROTECTION

American Power Conversion
200DL UPS - XT Size 147
450AT UPS - 386 Size 317
Curtis
Command Center 85
Ruby Plus 59
Datashield
CPS-60 - 6 oulet surge 19
S-85 - 6 oulet surge EMI/RFI protection 49
S-100 - adds modem protection 57

FastData 286/12 $899

Imagine a fast 286 computer at a super price and you've got the FastData 286/12. This system is complete, not stripped. You get one megabyte of zero-wait-state memory and a 28ms IDE hard disk - standard. Also included is an amber monitor and graphics card, your choice of a high density 1.2mb or 1.44mb floppy drive and a Keytronics keyboard. And since its a FastData, you are backed with toll-free technical support, one year warranty with the FastShip replacement program & on-site service plan, and our 30 day full money back satisfaction guarantee!

- ✓ 12mhz 80286 processor.
- ✓ 1 megabyte RAM.
- ✓ 40 mb 28ms hard disk 1:1 interleave.
- ✓ 1.2mb 5.25" or 1.44mb 3.5" floppy drives
- ✓ Standard chassis (shown with optional chassis - $50)
- ✓ Five drive bays.
- ✓ 200 watt power supply.
- ✓ Phoenix BIOS.
- ✓ Monochrome monitor with monochrome graphic board.
- ✓ Clock calendar, parallel port, and two serial ports.
- ✓ Keytronics enhanced 101 keyboard.
- ✓ 8 expansion slots, 6 available.
- ✓ Full documentation.
- ✓ FCC Class B approved.

System Price	40mb	65mb	80mb	100mb
Monochrome	$899	$999	$1,149	$1,249
VGA Color	$1,229	$1,329	$1,479	$1,579
VGA 1024	$1,379	$1,479	$1,629	$1,729

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Software

DATABASE

Clarion Personal Developer	45
Clarion Professional Developer	Call
Clipper 5.0	459
DataEase	459
dBase III+	419

FoxPro $417

The fastest, most powerful, Dbase language relational database available today. Includes windowing, desk accessories, memo fields, and report writer. The trace window lets you watch while FoxPro debugs your programs. Add a mouse and you can run it with point and click ease.

dBase IV	479
dBXL Diamond	129
Foxbase Plus	177
FoxPro	417
Paradox	419
Q & A	214
RapidFile	99
Rbase for DOS	447
Reflex	159

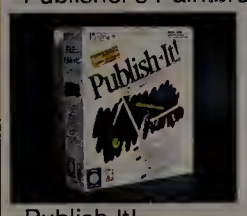
DESKTOP PUBLISHING & GRAPHICS

Autosketch	83
Corel Draw	309

Corel Draw $309

Winner of all the top awards, Corel Draw gives you more for your money. It supports the new Windows & includes incredible drawing and editing tools. Includes over 100 typefaces and 300 pieces of clipart. CorelTrace converts scanned art to smooth vector images in seconds. This is the most complete illustration package we've ever seen!

DrawPerfect	265
Freelance Plus	307
GEM Desktop Pub.	159
Generic Cadd Level 2 Starter Kit	109
Generic Cadd Level 3	199
Harvard Graphics	275
Pagemaker	479
PC Paintbrush IV Plus	109
Perspective Jr.	69
PFS:First Publisher	89
Publisher's Paintbrush	149



Publish It! $104

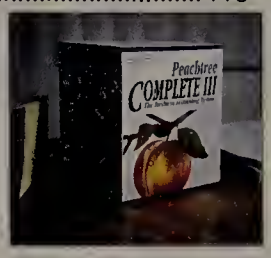
The top-rated, entry-level desktop publishing software runs well even on an XT. Includes the GEM/3 user interface with easy pull down menus and multiple size page views. Supports most popular printers and has a variety of built-in fonts and sizes.

Publish It!	104
Ventura Publisher Gold	519

FINANCIAL

Bedford Integrated Acct.	145
DAC Accounting 4.0	79
DAC Bonus Pack 4.0	157
Dollars & Sense	Call
Managing Your Money	113

Peachtree Complete III $139



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Peachtree with Data Query	209
Quicken	35

INTEGRATED

First Choice	105
SmartWare II	Call
Windows 3.0	89
Works	89

MICE

Keytronics Professional	59
Logitech HiRes C9 Serial	65

Logitech C9 Serial Mouse

$65 Our best-selling mouse is top rated also. Comes with software to adjust the resolution just the way you want it and includes driver software and Pop-Up-Dos to make your computer hum at your fingertips. For PaintShow, add $15.

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Logitech Trackman Serial	75
Microsoft Serial or Bus w/ paint	95
Microsoft with Windows 3.0	147
PC Mouse II Serial or Bus	79

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Turbo Pascal	90
Quick Basic	60
Quick C	60
Quick Pascal	60

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Allways	106
Excel	Call
Lotus 1-2-3 version 2.2	325
Lotus 1-2-3 version 3.0	Call
Lucid 3-D	53
Quattro Pro (call for details)	89

Lotus 1-2-3 Version 2.2 $325

The standard for spreadsheets, Lotus 1-2-3 version 2.2 is faster and more powerful than previous versions that made it famous. Includes add-in manager and more functions for greater flexibility. Also comes with Allways for great presentations made easy.

WORD PROCESSORS

GEM First Word Plus	52
Grammatik IV	49
Multimate 4.0	267
Professional Write	149
Rightwriter	45
Sprint	117
Word	209
Word for Windows	309

WordPerfect 5.1 $239

What can we say? WordPerfect is the #1 rated word processor and the top selling software in the U.S.A. Its got almost every feature imaginable and yet it is easy to use. The current version adds pull-down menus, mouse support, table creation and equation editor. Add this to the best software support in the business and you can't go wrong!

Word Perfect 5.1	239
Word Perfect Add'l Station	153
Word Perfect Library	67
WordStar Professional	Call

WINDOWS SOFTWARE

Adobe Illustrator (GR)	279
Adobe Type Manager (UT)	59
Ami (WP)	115
Ami Professional (WP)	287
Asymetrix Toolbook	279
Corel Draw (GR)	309
DBfast/Windows (DB)	239
Excel (SS)	299
Form Publisher (DP)	139
Grammatik IV for Windows (WP)	49
PC Paintbrush for Windows (GR)	77
Pagemaker (DP)	479

Windows 3.0 $89

The graphical user interface everyone is talking about! Turns your 286 or above with 640K or more of memory into a powerful multitasking workstation that runs even non-Windows applications. Plus, if you buy Windows now from FastMicro, we'll throw in 10 of the best Windows shareware programs.

Publisher's Powerpak for Windows (DP)	45
Micrographix	Call
Microsoft Mouse w/ Windows 3.0	147
Windows 3.0	89
WingZ for the PC (SS)	309
Word for Windows (WP)	309

Utility Software

Control Room	69
CoreFast	60
Carbon Copy Plus	109
Desqview	68
Desqview 386	115

DESQview 386

$115 Bring multitaking to your 386. Includes DESQview, the award-winning multitasking environment. Also includes QEMM386, the memory manager for 386 machines that makes DESQview scream and can remap your TSR programs and transform your extended memory into expanded (EMS 4.0) memory. Includes Manifest Memory Analyzer as an added

Direct Access	54
Fastback Plus	109
FormTool Gold	52

FormTool Gold $52

The fastest, easiest way to create any form on your PC! Includes forms management, WYSIWYG preview, and intellegent line drawing. Has fill-in and merge capabilities and supports hundreds of printers. Includes over 100 pre-designed forms you can use or customize.

Formfiller	85
Headroom	59
Laplink III	85
MS-Dos 3.3	59
MS-Dos 4.01	59

Mace Utilities 1990	85
Norton Advanced	Call
PC Anywhere III	59
PC Tools Deluxe 6.0	79

PC Tools Deluxe $79

Get the collection of utilities that's won every award we've ever heard of! Includes Dos shell, desktop manager, disk cache, and data communications. Also includes hard drive utilities such as DiskFix, undelete, unfomat, backup and recovery. It also has Fax support, a special version of LapLink, and even more!

ProComm Plus	52
Prodigy	25
QEMM 386	52
QRAM	43

$52 ProComm Plus

Brings unequalled power to your modem! Includes 16 popular terminal emulations, 12 error-correction file transfer protocols, and a powerful script language. And it's easy to use and comes with an easy to understand manual and context sensitive help.

SideKick Plus	119
Sideways	37
Super PC Kwik	43
XTree Pro Gold	75

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HARDWARE SPECIAL ISSUE

HARDWARE for a Windows World

THE RIGHT HARDWARE CAN MAKE WINDOWS SIZZLE. IN OUR FOURTH ANNUAL HARDWARE SPECIAL ISSUE, YOU'LL FIND HUNDREDS OF PRINTERS, SYSTEMS, AND DISPLAYS PERFECT FOR TODAY'S HOTTEST ENVIRONMENT.

We admit it: We're a little *Windows*-happy—so much so that we've taken this Hardware Special Issue and turned it on its head. Instead of looking at hardware in the usual way, we've rounded up hundreds of systems, printers, and displays and evaluated them with *Windows* in mind.

Why are we so wild about *Windows?* Well, it's not just us; the response to our *Windows 3.0* coverage has been phenomenal. The word is out: *Windows 3.0*'s improved interface, memory handling, and ability to multitask DOS applications make it fast and friendly enough to earn a place on almost any business PC.

Of course, you're not obligated to run *Windows* on any of the hardware examined here—we're just betting that you'll want to someday. There's hardware here for all types of users, from the entry level to the performance hungry.

GETTING IN THE DOOR

The cold, hardware fact is this: You need a 386SX, a 386, or a 486 system to reap the full benefit of *Windows 3.0.* These machines enable you to run the environment in its enhanced mode, which offers three key features: access to as much as 16MB of physical memory, multitasking for both DOS and *Windows* applications, and a virtual memory routine that swaps data to disk if memory runs short. Without those capabilities, you face the same memory and performance restrictions that hurt earlier *Windows* versions.

The cheapest ticket to enhanced mode is an SX machine. Assistant Editor Susan Lusty compiled a Buyers' Guide of 85 16-MHz SX systems, each priced in a configuration specially suited to *Windows.* Loaded with a respectable 4MB of RAM, a good-sized hard disk (80MB to 110MB), and a VGA display, the machines range from over $6000 to a mouth-watering $1695.

For those with more to spend, we present the optimum *Windows* workstation. In a review of five small-footprint, 25-MHz 386 systems, Contributing Editor Scott Spanbauer assumes you want speed in a box that won't hog your desktop. High prices in this new category prevented us from awarding a Best Buy, but for those who savor Compaq reliability and support, the 386/25e is worth the expense.

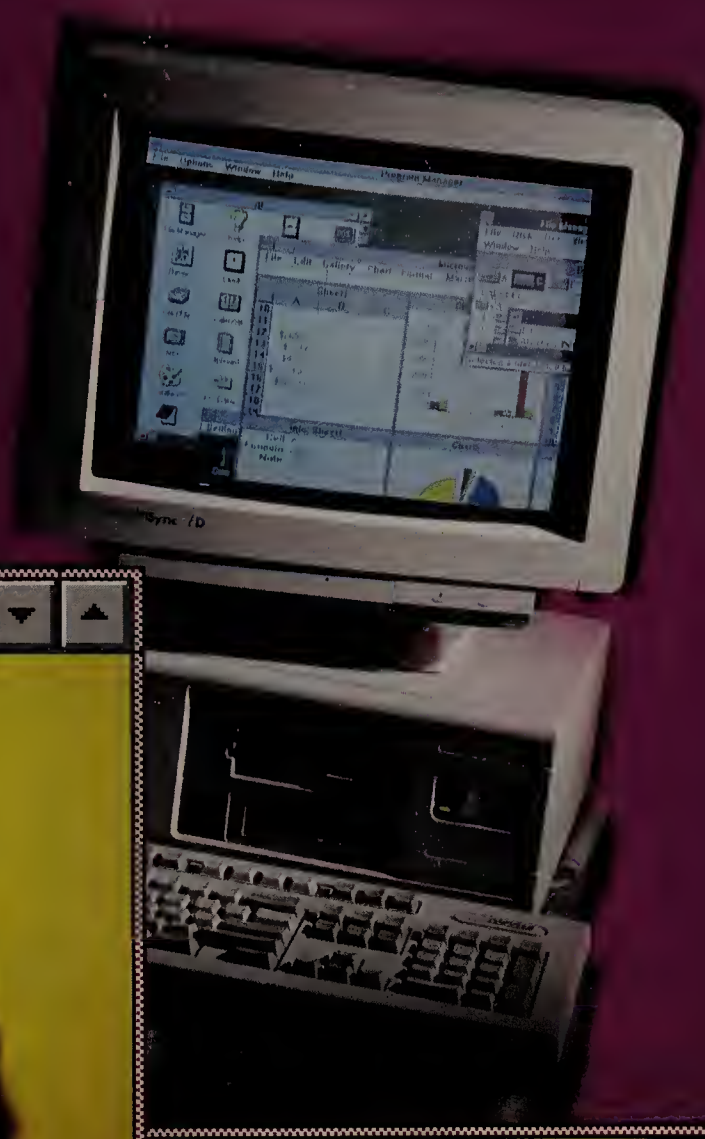
A BETTER VIEW OF WINDOWS

Look and feel are the key to *Windows'* ease of use, and what better way to enhance it than with an improved image? Contributing Editor TJ Byers and Editor Eric Knorr explore graphics one step beyond VGA in their Buyers' Guide to cost-effective monitors and video boards.

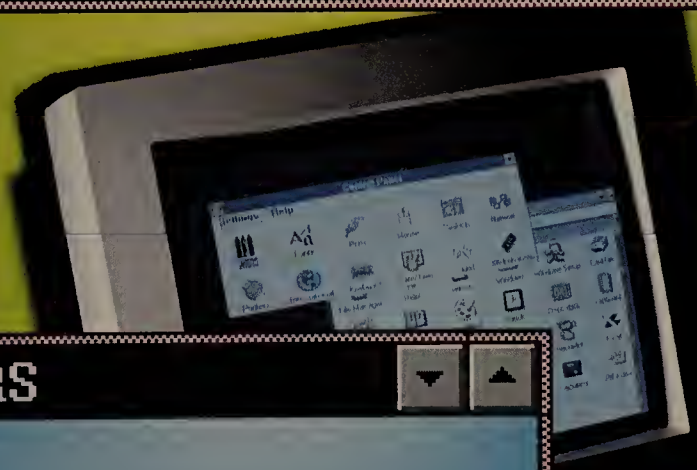
All the boards in the Guide come with special high-resolution *Windows 3.0* drivers that can make any

ROBERT CARDIN

SYSTEMS



LAPTOPS



PRINTERS

Best Buys in Windows Hardware

Basic System

To exploit Windows 3.0 you need at least a 16-MHz SX. The August Best Buy Acer 1100SX, which we've set up for Windows with 4MB of RAM and a 100MB hard disk, can hold four drives and 8MB of fast RAM. Its built-in VGA can run Windows 3.0 at 800 by 600, also the NEC MultiSync 2A's maximum resolution. The Toshiba PageLaser 6, a March Best Buy, delivers excellent print quality for text and graphics, plus enough speed to serve a work group.

Optimal Workstation

The Compaq Deskpro 386/25e, the best small-footprint 25-MHz 386 machine we've reviewed, has enough power for tomorrow's demanding Windows applications. Hercules' economical Graphics Station Card—which you can upgrade to display millions of colors—drives NEC's MultiSync 4D at a supersharp 1024 by 768 resolution. The Best Buy–winning NewGen TurboPS/480 can provide several times the resolution of standard PostScript printers, without a performance penalty.

3.0-compatible application look much sharper than VGA. For a combined list price as low as $500, a super-VGA board and an ordinary 14-inch multiscan monitor can increase resolution one-and-a-half times and the number of colors by a magnitude. For considerably more money, a graphics coprocessor board and a 16-inch monitor provide even greater resolution—plus blazing performance.

If you're willing to live with monochrome, our itinerant laptop reviewer, John Diebold, has a message for you: A new generation of VGA-equipped SX laptops proves that you *can* take *Windows* with you. These units aren't light, but they've got enough punch to knock the sluggishness out of mobile computing. Here you'll find a clear Best Buy: the Toshiba T3100SX.

WINDOWS ON PAPER

One of the pleasures of a graphical environment is having an editable, accurate display of fonts and graphics as they'll look when printed out. Without the right printer, though, that preview is a pipe dream.

As Associate Editor Daniel Tynan and Editorial Assistant Cathy Smith explain, there's no point in settling for anything less than a LaserJet II compatible. Their Buyers' Guide lists dozens of clones that do justice to graphics and print text quickly—some even serve a LAN better than a LaserJet.

Want a little more intelligence in your printer? Tynan and frequent contributor Ross Smith introduce you to six PostScript printers with built-in font-generating capabilities. Their review highlights fast printers with special high-resolution capabilities; the NewGen TurboPS/480 earns a Best Buy.

We can think of a host of reasons to buy a laser printer, an SX, a 386, or a high-resolution display. Arguably, you need such devices just to compute and stay competitive in the nineties. But if *Windows* is the main attraction, buy smart and keep the price of admission reasonable.

HARRY AUNG

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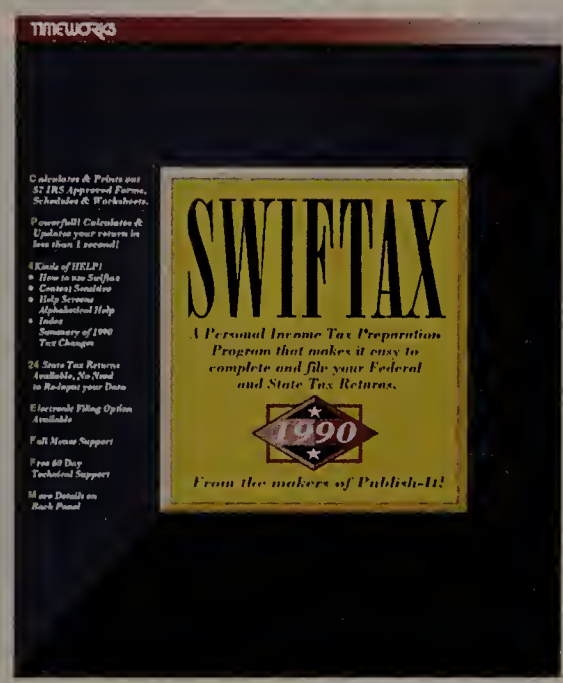
- **Free Technical Support**



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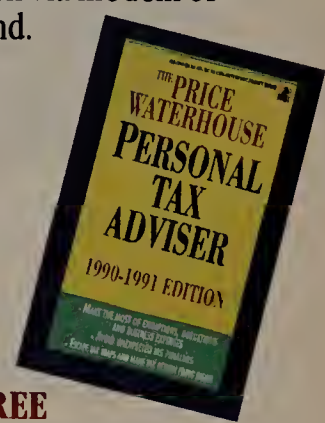

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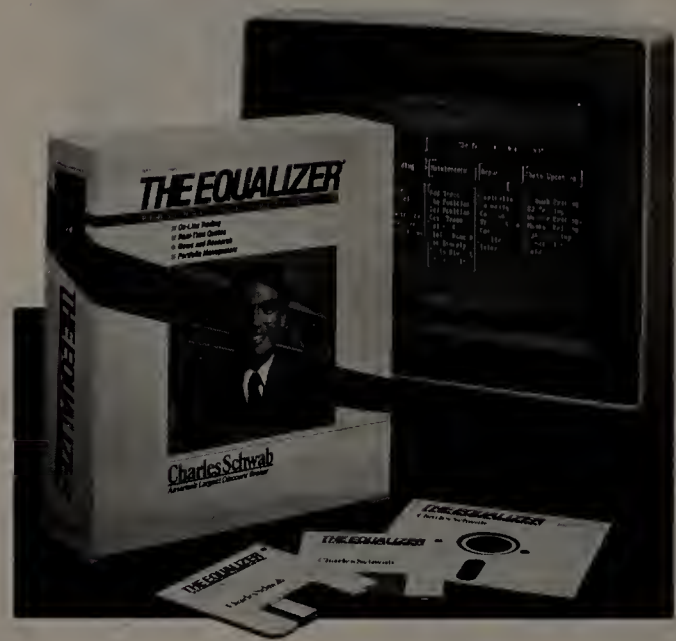

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System Total $3,995

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64K Cache Memory, DOS 4.01
System Total 25 MHz $5,450
With 33 MHz $5,950

NETSET 486E, EISA
80486- 25/33-MHz Processor, 4-MB RAM,
1.2 & 1.44-MB F.D.D.
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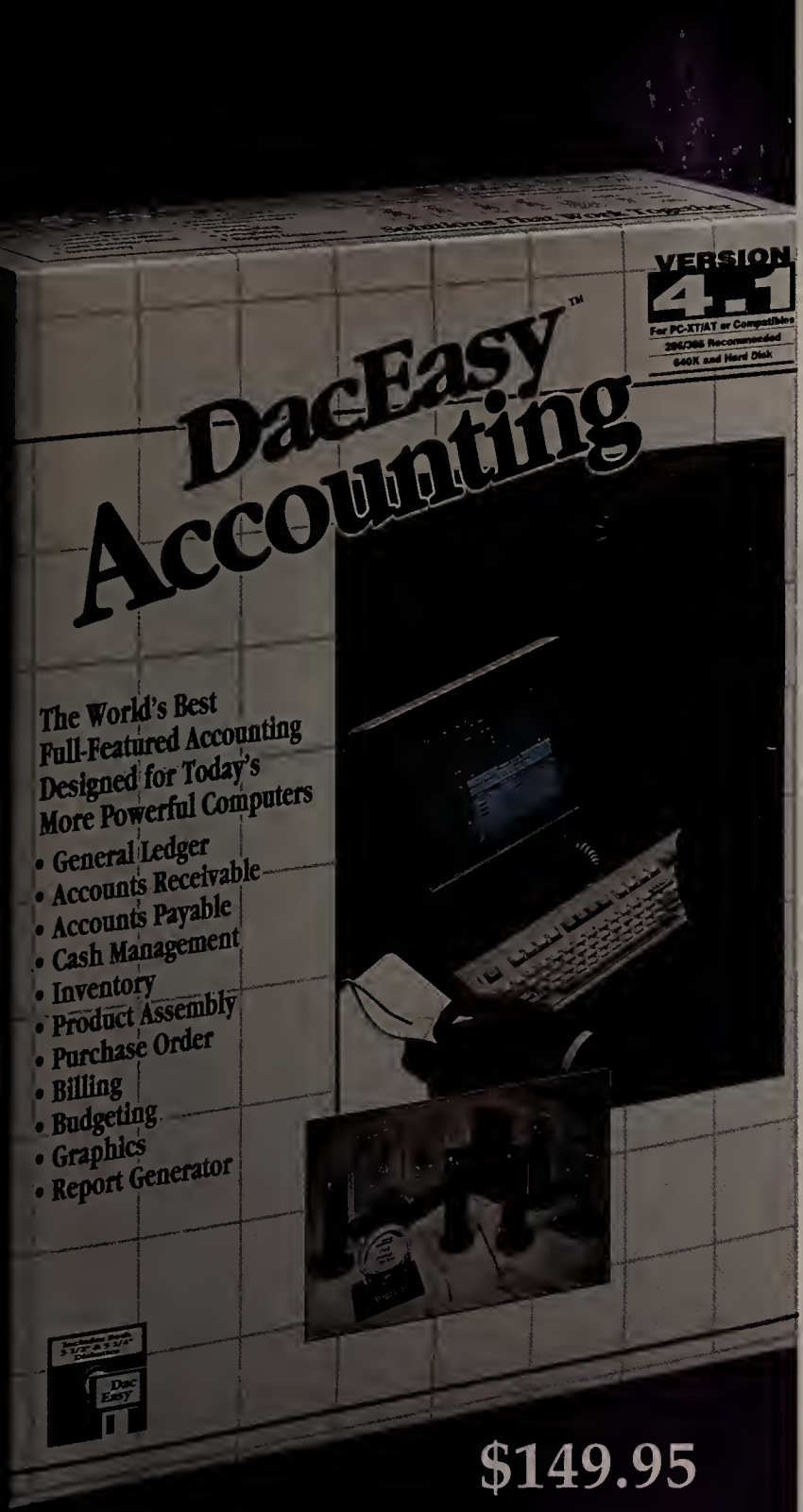

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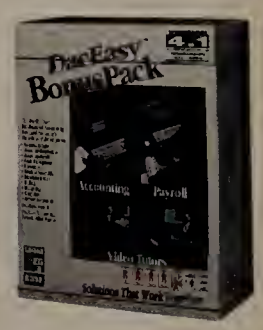

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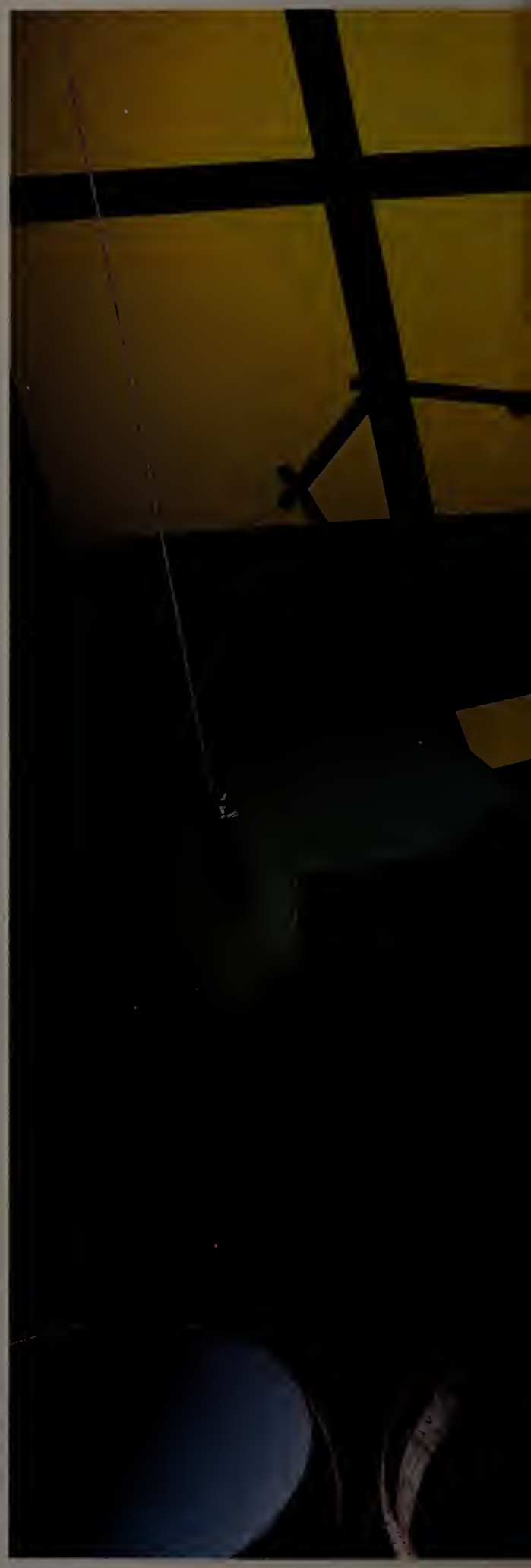
HARDWARE SPECIAL ISSUE

25-MHz 386s:

Great Performance in a Small Box

High-performance PCs don't have to be desk hogs. These alternatives offer enough power for serious Windows users.

Scott Spanbauer



MARC SIMON

Small-footprint 25-MHz 386 machines are the smartest desktop buy today—especially if you plan to run demanding graphics applications like *Windows*. These systems come with more than enough performance and RAM capacity to keep you productive through the next five years, for little more than what an AT cost in 1985.

They aren't your only choice, of course—just your best choice. *Windows* and its compatible applications are ravenous for speed and memory. While such slower machines as 16-MHz 386SXs make perfectly fine entry-level business systems, they provide merely acceptable *Windows* performance and may prove increasingly frus-

Toshiba's T8500 boasts the lowest price (and smallest footprint) here.

FEATURES EVALUATION

Compact, but Room to Grow

The Compaq Deskpro 386/25e combines expandability with high performance and quality. The Tandy 4025LX and the Toshiba T8500 Model 25 cost less but can't match the Deskpro's speed or device capacity.

● Yes
○ No
◒ Deficient

	Compaq 386/25e	IBM PS/2 Model 70-A21	NEC PowerMate 386/25S	Tandy 4025LX	Toshiba T8500 Model 25
Standard features					
Street price [1]	$6718	$7012	$5241 [2]	$6288	$4702
List price [1]	$7973	$9364	$7102 [2]	$6288	$7922
80387/Weitek 3167 support	●/●	●/○	●/●	●/●	●/●
Disk caching software	●	●	● [3]	● [3]	●
Built into motherboard					
Hard disk connector	●	● [4]	●	●	●
Mouse port	●	●	●	●	○
VGA	●	●	○	○	●
CPU-speed RAM					
Capacity	16MB	8MB	16MB	16MB	14MB
Expandability					
32-bit slots/number free	1/1 [5]	2/2 [6]	1/0 [5]	2/0 [5]	0/0
8/16-bit slots/number free	4/4	1/1 [6]	4/3	6/5	3/3
8-bit slots/number free	0/0	0/0	0/0	0/0	1/1
Third/half/full-height bays	3/1/0	0/3/0 [7]	0/3/0	2/2/0 [8]	1/2/0 [7]
300MB or larger hard disk available from manufacturer	●	○	○	●	○
Design and construction					
Switchless setup	○	●	○	●	○
Tilt-and-swivel monitor	●	●	●	○	○
Front-panel on/off switch	●	●	●	●	●
Front-panel reset button	○	○	○	●	●
Service and support					
Free on-site service	○ [9]	○ [9]	○	○	●
Toll-free support number	○ [9]	○ [9]	○ [9]	○	●
Daily support (hours)	◒ [9]	◒ [9]	◒ [9]	9½	10
Weekend support	○ [9]	○ [9]	○ [9]	○ [9]	●
Electronic bulletin board service	○ [9]	●	●	●	●

[1] Except as noted, price based on 4MB RAM, at least 100MB hard disk, 1.2MB or 1.44MB 3½-inch floppy drive, VGA and color VGA monitor, at least one parallel and one serial port, 101-key keyboard, mouse, and DOS 4.01. If the vendor doesn't offer a mouse, we added $99 to the street price and $125 to the list price to represent the cost of a basic Microsoft Mouse.
[2] List price reflects the $130 cost of adding DOS 4.01; the street price adds $100.
[3] SmartDrive (included with DOS 4.01).
[4] ESDI connector.
[5] Dedicated memory board slot(s).
[6] Micro Channel slot(s).
[7] 3½-inch form factor only.
[8] Third-height bays are 3½-inch form factor.
[9] Via dealer: Some variation will be found from one dealer to another.

trating as new, feature-heavy *Windows* versions of *WordPerfect*, *1-2-3*, and *Ventura Publisher* appear. Conversely, both 486s and 33-MHz 386s are amazingly fast, but they command cutting-edge prices—and you just don't get that much more for your money.

Besides, 486s and 33-MHz 386s generally come in full-sized, desk-hogging boxes. Smaller, 25-MHz systems sacrifice some expansion slots and some hard disk expansion capacity, but they make the most of an even more finite resource—desktop space. And since more and more office PCs are being networked, the server can pick up some of the mass storage slack.

The key buying issues for these machines are performance and RAM capacity. The need for plentiful CPU-speed memory is particularly important in the world of *Windows*. Eventually, as RAM prices fall, a desktop *Windows* workstation loaded with a full 16MB of CPU-speed memory will be perfectly feasible. If the system you buy hits the wall at much less than that, you may spend the next five years wishing you'd planned a bit better. A good number of device bays and expansion slots and a reasonable price should be critical factors in your buying decision, along with quality of design and construction, warranty, and tech support (see the sidebar "Buying Smart" for more details).

We gathered five small-footprint 25-MHz systems for a knock-down, click-and-drag GUI fight. We set up and priced these machines in a standard configuration appropriate for today's *Windows* user: 4MB of RAM, one floppy drive, a 100MB or larger hard disk, at least one parallel and one serial port, a VGA video controller and color monitor, a 101-key keyboard, a mouse, DOS 4.01, and a disk cache.

To make sure you get real-world cost comparisons you can use to make practical buying decisions, we put our crack research team to work. All the prices in the following reviews are street prices obtained through an extensive nationwide phone survey and based on the

IBM's PS/2 Model 70-A21 is something of a speedster—and thanks to its easy-access chassis design (no cables or screws allowed), you won't need any tools to remove or replace components. However, it doesn't come cheap: This is the most expensive system reviewed.

MARC SIMON

standard *PC World* configuration just noted. (Three of the five manufacturers in this review do not sell a mouse, in which case we added $99, the average street price of a mouse, to the price of their products.)

Compaq 386/25e

PROS: Top speed, top expandability

CONS: Pricey, cramped access to internal devices

If you've been around the PC block once or twice, the name Compaq is bound to conjure up two notions: high quality and high price. The Compaq 386/25e is no exception. It's the fastest system in the roundup, offers an excellent 16MB CPU-speed memory ceiling, and comes with lots of room for extra drives and expansion boards. It is, in simple fact, the best small-footprint 25-MHz 386 in the world. Not surprisingly, it's also the second most expensive system reviewed.

You don't need a screwdriver to get under this computer's hood, as the case is secured by three thumbscrews. Once you're inside, however, life becomes more complicated. The 386/25e contains an impressive four free expansion slots and four drive bays—but at the expense of accessibility. The case is so densely packed that if you should ever want to extricate one of the front-mounted drives, you'll have to disconnect and remove the internally mounted 120MB IDE hard disk first. Similarly, if you accidentally pull a cable loose, the motherboard's connectors for the floppy and hard drives' cables are very difficult to reach.

Like many manufacturers, Compaq lets its dealers handle service and tech support. Dealer support can be hit-or-miss, but it's common knowledge that Compaq has some of the most highly trained and qualified dealers in the business. Moreover, Compaq trainers make regular rounds, providing dealers with a steady supply of printed and video- and computer-based service updates.

Though it has blazing speed and excellent expansion capacity, the 386/25's price is a little hard to swallow. But if you've got to have the best and you need it today, this Compaq fills the bill.

IBM PS/2 Model 70-A21

PROS: Good performance, unmatched chassis design

CONS: Prohibitive price, limited expansion capacity

Like Compaq's offering, IBM's system is anything but a bargain. In fact, at

NEC's PowerMate 386/25S is quite inexpensive, considering that its capacity for CPU-speed RAM is outstanding and Windows 3.0 is included. But performance is not impressive.

$7012 on the street, it's the costliest system in this review. Unlike its Texas cousin, however, the Model 70-A21 suffers from substandard RAM and device capacity.

CPU-speed memory tops out at 8MB. If you ever need to expand beyond that (and in the world of *Windows* it's only a matter of time), you'll find the Model 70-A21's performance falling off, since the extra memory has to be placed in a relatively slow expansion slot. And since IBM gives you only three slots to begin with, your add-in options are severely limited.

Similarly, when it comes to a hard disk upgrade path, the Model 70-A21 gives you few choices. The standard 120MB hard disk comes preinstalled in a half-height bay with a proprietary connector. IBM doesn't sell a larger drive to go into that bay. Moreover, the two externally accessible half-height bays are designed to accept only floppy or tape drives. Hence, there's no place to put a second hard drive.

IDE or ESDI drives deliver higher throughput than SCSI or ST506 units.

IBM is still the reigning champion of easy-access chassis design. There are no cables or screws, and everything inside the box can be removed and replaced without tools, from CPU-speed memory to drives.

PS/2 machines have a well-deserved reputation for durability, and like Compaq, IBM handles service and support via a highly qualified dealer network. Nevertheless, this system's low fast-RAM capacity and astronomical price make it a bit like Cinderella's coach: In a couple of years, when your expansion needs hit the Big Blue wall, the Model 70 may start looking like a high-priced pumpkin.

NEC PowerMate 386/25S

PROS: Low price, excellent RAM capacity, includes Windows 3.0

CONS: Slow; largest hard drive option is 140MB

At $5241, the second lowest street price in the roundup, NEC's petite PowerMate 386/25 is nicely priced and has an excellent 16MB CPU-speed RAM ceiling. It could have been a Best Buy, if not for its poky performance and merely average expandability.

Although there's an IDE hard disk connector on the 386/25S's motherboard, the company didn't have IDE disk drives available when our review unit was manufactured, so an expansion slot that would otherwise have been free was tied up with an ESDI hard disk controller. NEC promises that 45MB and 100MB IDE drives will be standard by the time you read this, and that the IDE-equipped systems will be substantially less expensive than its current ESDI drive systems.

In any case, the largest hard disk (ESDI or IDE) you can buy from NEC is 140MB. If you want more hard disk capacity than that, you'll need to add a second drive—and since this system contains only three half-height bays, a second hard drive rules out a second floppy or a tape drive.

One option you should plan on adding is a copy of DOS 4.01. The 386/25S comes standard with DOS 3.3, but our first round of testing revealed surprisingly poor performance with that

MARC SIMON

BUYING SMART: WHAT TO LOOK FOR IN A WINDOWS WORKSTATION

The relentless escolation of PC power over the last decade may seem to be the result of hidden forces, like the hond of some silicon god rippling the waters of technology. In fact, the mojor factor driving the development of hordwore has always been the same: softwore. The lotest star, *Windows 3.0,* works best on an 80386-based computer—one with plenty of power, scads of memory, and a large, fast disk drive to deliver no-wait GUI performonce.

Performance

Especiolly under *Windows,* performance is determined by a number of foctors, including processor, disk, and video controller speed. Since all the 25-MHz 80386 machines reviewed here ore powered by identical CPUs, our performance tests—and the *Excel* under *Windows* test in particular—tend to reflect differences in disk ond video throughput. (On CPU-intensive tests like the *1-2-3* one, for instance, scores for oll mochines were virtually identicol.)

Because *Windows* involves a great deol of disk activity, o slow drive/controller/cache combo con hove a dire impact on an otherwise high-performonce system. We recommend systems with fost IDE or ESDI drives, since they deliver higher throughput than SCSI or old-fashioned ST506 or MFM-type units. In oddition, IDE drives hove the odded odvantoge of saving a slot becouse the controller electronics ore built onto the drive.

CPU-Speed RAM Capacity

Windows needs a lot of RAM. For one thing, when RAM runs short, *Windows* swaps data from memory to disk—preventing loothsome 'out of memory' messages but olso cousing o perceptible slowdown. Although disk-swopping deceleration can be minimized by installing a permanent swop file and (most effectively) by keeping your hard disk unfragmented, it's best to avoid the problem oltogether by moking sure you've got plenty of RAM. You'll also need o generous amount of RAM for multitasking applications and for SmartDrive, *Windows'* performonce-enhoncing disk cache utility.

CPU-speed memory (fast RAM) is instolled either on the motherboord or on o special high-speed memory bus. A low ceiling on fast RAM will force you to instoll odditionol memory on the slower 16-bit exponsion bus, degroding performance. Our stondord configuration includes 4MB—a reasonoble minimum for today's *Windows* needs and more than enough for most non-*Windows* users. The next generation of *Windows* applications is already appearing, however, brimming with memory-gobbling features—ond RAM prices are dropping. While 4MB of fost RAM seems like plenty today, it won't be long until 8MB is the bosic buy-in.

Expandability

It's astonishing how quickly exponsion slots fill up. Internol modems, network odapters, extra I/O ports, and video, mouse, and tope drive controllers all vie for the ovailoble system reol estote. Fortunotely, many devices that formerly needed exponsion slots—such os mouse odopters, video controllers, and I/O ports—ore now built onto the system board. For most users, four free slots should suffice, although if you rely on exotic peripherols such as CD ROMs ond sconners, even four slots may not be enough.

Drive boys fill up too, especiolly in o small-footprint chassis, where they're in short supply to begin with. While hord-disk capacity keeps rising, the sheer size of *Windows* itself, combined with *Windows* opplications ond their often lorge files, means that all but the largest drives will fill up a lot faster than you'd think. Our standard configuration is based on a 100MB hard disk, but the availability of a 300MB hard disk is criticol. Moreover, storage devices seem to proliferate like unpaid bills; buying a system with less than four device boys is osking for trouble (unless it will be connected to o network).

Design and Construction

Look for o chassis that gives you easy access to internal switches, connectors, ond peripherals. Important controls should be placed on the front panel. *Windows* will be easiest to use on o shorp color display with a tilt-and-swivel monitor.

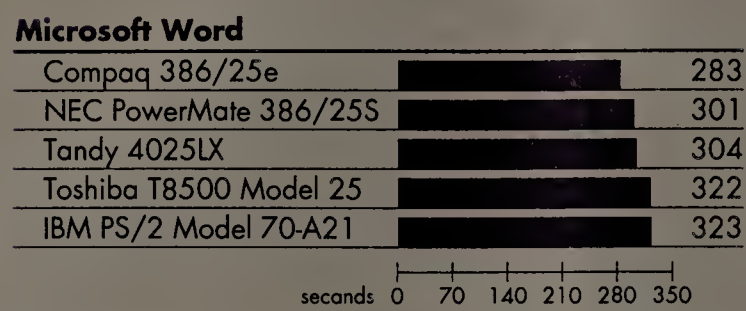
Service and Support

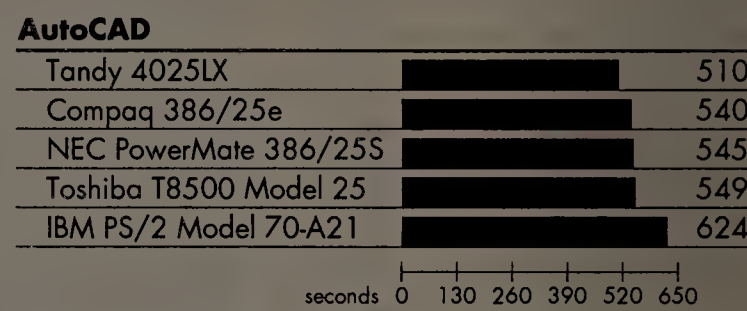
Whether it comes from the manufacturer or the deoler, you should expect to receive a one-yeor warranty. Free on-site service is relatively rore but con be a lifesover, especially for smoll businesses. (Fortunately, on-site service is often ovoiloble from dealers os part of an extended warranty packoge that usually runs about $200 o yeor.) Prompt and preferably toll-free telephone tech support can also sove your grits. Look for the monufacturer or dealer that offers the longest support hours. We called a number of them, and the averoge number of daily support hours was nine; very few dealers offered 800 numbers or weekend support. All the dealers we tolked to accepted tech support questions by fax. —*S. S.*

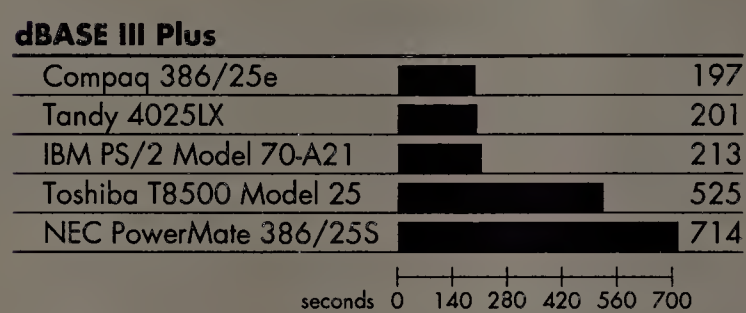
PC WORLD TEST REPORT

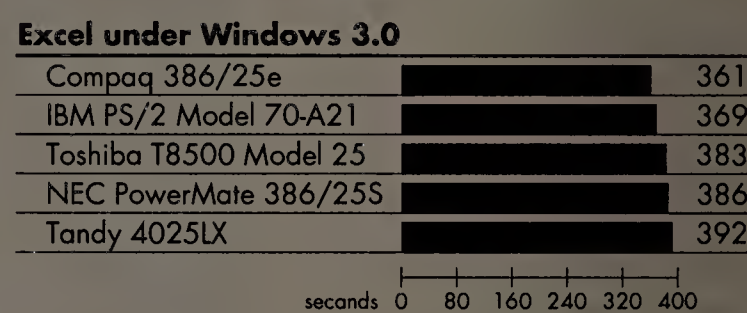
Compaq Holds the Performance Edge

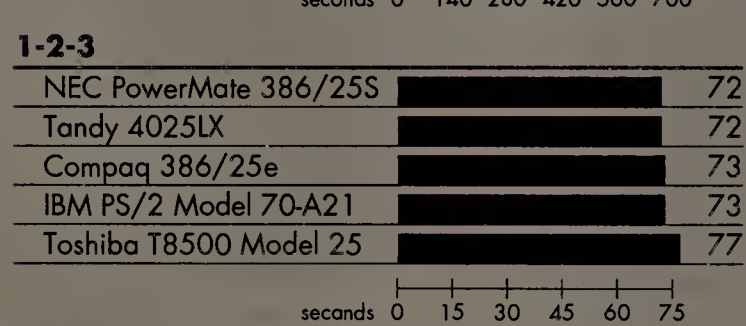
The Compaq 386/25e is quickest overall of these small-footprint 25-MHz 386s—although not by much. The Tandy 4025LX follows close behind.











Methodology
All the computer systems were tested with a 256K extended-memory disk cache except in the *Excel* under *Windows 3.0* and the *1-2-3* tests. All systems were tested with 4MB of RAM. Every computer was tested with the vendor's version of DOS. The systems had the following sizes of hard disks: NEC PowerMate 386/25S and Toshiba T8500 Model 25, 100MB; Tandy 4025LX, 105MB; Compaq 386/25e and IBM PS/2 Model 70-A21, 120MB.

Microsoft Word 5.0
Microsoft Word loads and quits the program, loads a document 50 and then 100 times, black-copies the entire document 100 times, performs multiple search-and-replace operations, and repaginates and checks the spelling of a 90-page document. The document is scrolled in both graphics and text mode, saved 25 times, and printed to an output file. Although the results of the benchmark depend primarily on processor and memory access speeds, display adapter and hard disk speeds are also contributing factors.

dBASE III Plus 1.1
The *dBASE III Plus* test measures the time required to process a batch of 250 transactions. Each transaction consists of updating a record in the Accounts, Teller, and Branch files and in an indexed History file. In this benchmark, which uses a disk cache, sequential read performance becomes more important than random access.

1-2-3 2.01
In this benchmark, a *1-2-3* macro executes a series of recalculations using five different formulas within a 75-by-75-cell matrix. Because there are few screen updates and no disk access is required, the results depend almost entirely on processor and memory access speeds.

AutoCAD 10
In this benchmark, a three-dimensional sample drawing is retrieved and displayed from multiple perspectives. A 3-D array is created using an AutoLISP routine, new elements are introduced, and a drawing is generated with filling on and off. The results of the test depend primarily on the speeds at which the processor and coprocessor operate and at which memory is accessed. The performance of the display adapter and of the hard disk also have some effect.

Excel under Windows 3.0
In this benchmark, *Excel 2.1c* running under *Windows 3.0* executes these operations: transcendental calculations; cuts and pastes; charting; inserts and deletes; financial calculations; array functions; data base functions on a 100K, 500K, and 1500K data base; file operations; defined functions; and a large recalculation. The results of this benchmark depend primarily on processor and memory access speeds.

Data based on tests designed and conducted by National Software Testing Laboratories (NSTL), Conshohocken, PA 19428. All rights reserved.

version. Accordingly, we retested with 4.01 and its SmartDrive disk cache. We got much better results with 4.01, so we have added $100 to the PowerMate's street price to cover the price of this NEC option.

Also, plan on shopping around to find the dealer with the best support policies and options: NEC's centralized support is limited to an in-house BBS. For most day-to-day problems, you'll be dependent on your dealer. Still, given its low price and high CPU-speed RAM ceiling, the PowerMate 386/25S should give you years of economical service.

Tandy 4025LX

PROS: Good performance, excellent expansion capacity, high fast-RAM ceiling

CONS: Pricey

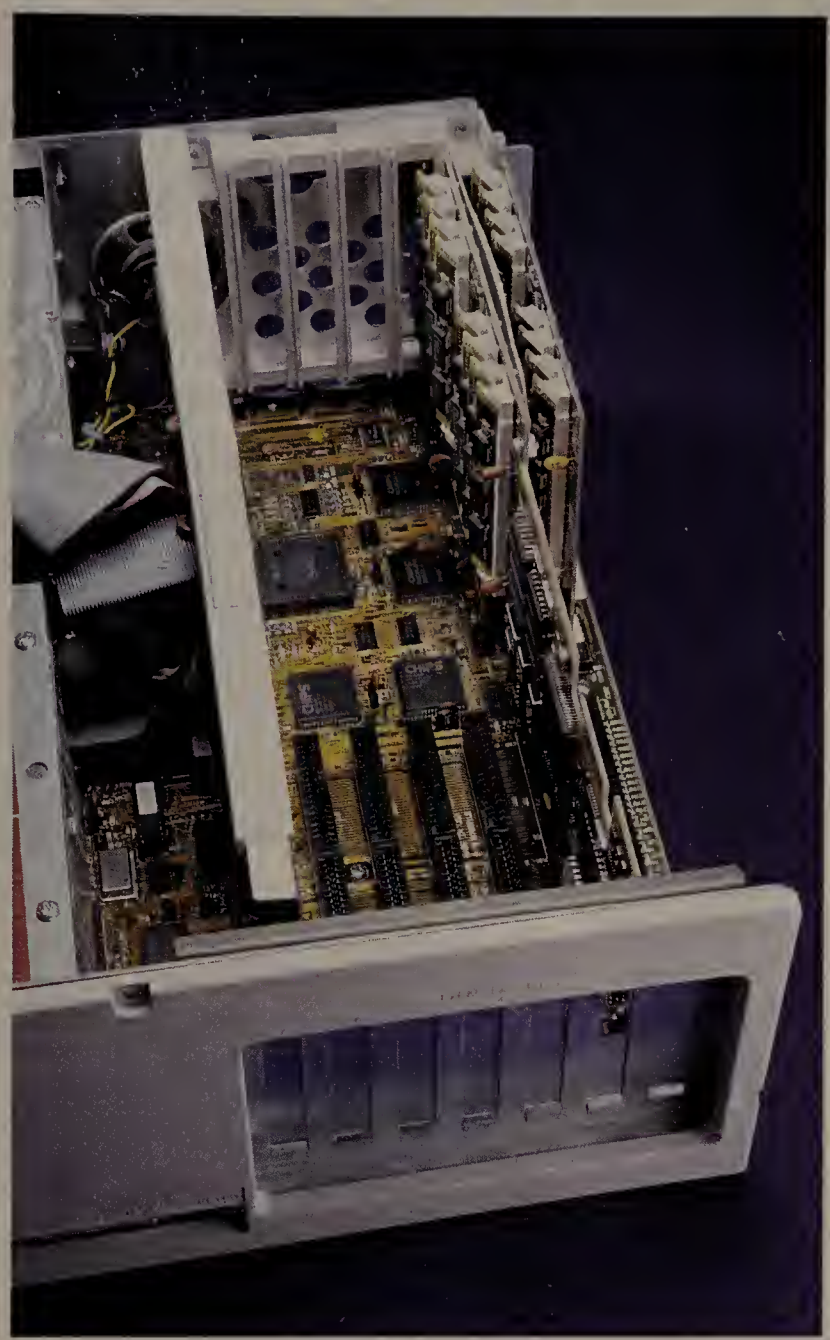
Tandy's 4025LX is a reasonably good value thanks to its high CPU-speed RAM ceiling, good performance, and generous complement of free slots and device bays. However, at $6288 it's somewhat overpriced.

The 4025LX comes in two memory "models," 2MB and 8MB. While both can be expanded to 16MB, the 2MB model will go only to 4MB before you must discard all the 256K SIMMs you've paid for and replace them with 1MB SIMMs. The 8MB model is obviously more expensive to start with, but since it starts out with 1MB SIMMs, the upgrade process lets you keep the memory you've bought and simply add more. We recommend starting with the pricier 8MB system, since the upgrade path to 16MB will then be a lot cheaper.

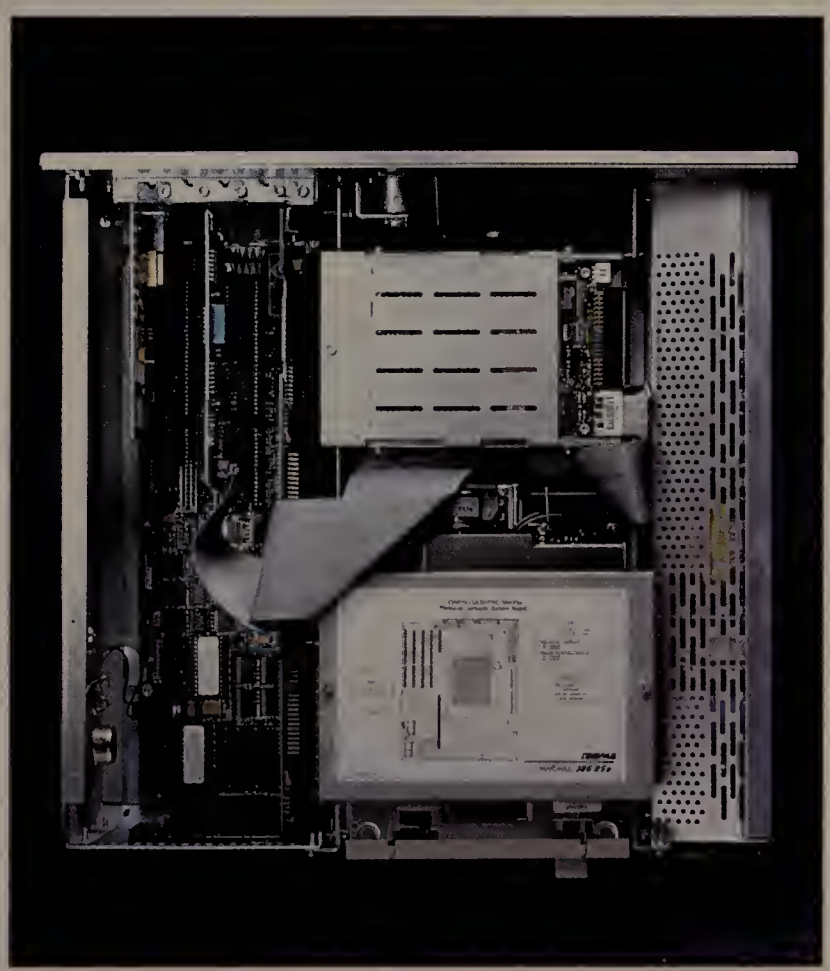
The 4025LX is slightly larger than the other systems in the roundup, but while it may take up a little extra space, its size comes with an attractive fringe benefit: outstanding expandability. Along with two half-height and two third-height drive bays, Tandy delivers five free expansion slots—the highest count in the roundup.

Tandy sells and supports its PCs through Radio Shack stores, which are generally close at hand. But Radio Shack has a reputation for frustrating customers who need parts and service in a hurry. Tandy also offers a central (not toll-free) tech support number. We called three times: The line was busy once, and twice we had to hold for several minutes before receiving service.

While the 4025LX's price is high, Tandy packs its slightly oversized case with plenty of room for CPU-speed RAM, drives, and adapter boards. Unless absolutely top performance is a must, you can't go too far wrong with this system.



The Tandy 4025LX is larger than the other systems here and gives you five free slots—the best count in the roundup.



Compaq's 386/25e gives you only four slots, but that's still better than most—and there's lots of room for drives.

MARC SIMON

Toshiba T8500 Model 25

PROS: Small, low price, easy internal access, free on-site service

CONS: Mediocre performance, limited drive capacity

The T8500 is the smallest system in this review and, at $4702, the least expensive. Moreover, it offers free on-site service and weekend tech support—very rare commodities. But before you jump for this tempting tidbit, bear in mind that its performance is merely OK and that its low profile means less room for hard disk expansion.

The T8500's unique design lets you install boards in its four expansion slots and expand the system's SIMM memory via a handy side panel that eliminates the need to lift the monitor (being careful not to yank the cable), find a place to put it, clear space to slide the cover off, and find a place to put the cover before you can get inside the unit. (Although the panel design is an improvement, it would be even more convenient if the panel were secured with fewer than six screws.) The T8500 also provides a handy, front-mounted setup switch for configuring serial ports, IRQ addresses, and the like. There's no room inside for a 5¼-inch drive, but Toshiba will sell you an external one that hooks up to a connector on the back of the machine. This is the only system in the roundup to give you either a second serial port or a SCSI connector (which you can use to attach a chain of external drives). Unfortunately, it's also the only system in the roundup without a built-in mouse port.

The T8500 offers good CPU-speed RAM capacity: You can install 2, 4, 6, or 14MB—enough to keep you crunching graphics for several years. However, since there are only three drive bays (one of which holds the floppy drive), and the biggest drive you can buy from Toshiba is 100MB, your only choices for more disk capacity are to install a second 100MB drive in the remaining bay (leaving no room for an internal tape drive) or to use the SCSI port to hook up external devices.

Toshiba is the only manufacturer in this roundup to offer free on-site support—a big plus that can save you a lot of time and money if something goes wrong. There's also a toll-free tech support number that works on weekends, and a BBS. Get out a copy of *PC World* before you pick up the phone, though; all

EXECUTIVE SUMMARY

Windows Workhorses

25-MHz 386 systems fit forward-looking Windows users to a T.

Fast, small-footprint 25-MHz 80386 machines are getting cheaper every minute. Windows has a powerful hunger for speed, RAM, and storage, and those factors—along with price—separate the good buys from the bad.

Although none of the machines reviewed rates a Best Buy, three are worth serious consideration. The **Compaq 386/25e** is fast and expandable, but it's a bit pricey. The **Tandy 4025LX** is a less expensive but somewhat slower alternative. The **Toshiba T8500 Model 25** boasts an unbeatable price, but it's even slower than the Tandy and has a lower capacity for CPU-speed RAM.

	Compaq 386/25e	IBM PS/2 Model 70-A21	NEC PowerMate 386/25S	Tandy 4025LX	Toshiba T8500 Model 25
Performance	Excellent	Good	Fair	Good	Fair
CPU-speed RAM capacity	Excellent	Fair	Excellent	Excellent	Good
Expandability	Excellent	Fair	Fair	Excellent	Good
Design and construction	Good	Excellent	Good	Good	Good
Service and support	Good	Good	Good	Fair	Excellent
Price	Fair	Poor	Good	Fair	Excellent
Overall value	Good	Fair	Good	Good	Good
Reader service no.	805	806	807	808	809

How we rate small-footprint 25-MHz 386 systems
We rate these systems based on information in the Features Evaluation and the PC World Test Report, combined with our opinions of quality, reliability, and user benefit.

Performance is the key to productivity with *Windows*. How quickly data appears in an on-screen window is affected by CPU, video controller, and disk drive characteristics. The standard deviation of the PC World Test Report benchmarks determines the ranges for the Executive Summary ratings.

CPU-speed RAM capacity refers to the amount of RAM installable on the motherboard or on a fast, 32-bit bus. This is a primary criterion because low capacity can significantly inhibit the performance of *Windows* applications. Only those machines with a 16MB or higher capacity receive an Excellent rating.

Expandability applies to the number of free slots and the number and density of mass storage devices supported. To receive an Excellent rating, a system must have at least four slots open and ram for a total of four half- or third-height drives (five slots and three bays will also do), and it must offer at least 300MB of hard disk storage (from combined hard drive options).

Design and construction includes quality of manufacture, accessibility of controls, and ease of setup. Excellent ratings are awarded to well-designed and -manufactured systems with switchless setup, quality monitors, and durable keyboards.

Service and support includes the length of warranty, quality and availability of phone support, documentation, support hours, and other support services. At least one year's full warranty, free on-site service, toll-free tech support, long support hours, and effective response are required for an Excellent rating.

Price ratings are awarded by calculating the standard deviation from the average street price.

Overall value takes into account all the above criteria. Because *Windows 3.0* is a processor-intensive application with an unprecedented capacity to use memory, we put extra weight on performance and CPU-speed RAM capacity. Because space is limited inside these small-footprint systems, expansion capacities for drives and boards are also major evaluation factors.

ON NOVEMBER 12, NORTON 5.0, SPINRITE II, PC TOOLS, OPTUNE AND DISK TECHNICIAN™ WILL BE OBSOLETE.

All these utilities claim to make maintaining your hard disk as easy as possible. One even claims to "do the thinking for you."

Yet, with each of these programs, you have to decide what test to run and when to run it. Which is, unfortunately, usually after a disaster has already occurred. And because of the way they test, you're forced to wait, sometimes for hours.

But on November 12, all these utilities will go the way of the dinosaur. Because that's the day new *Disk Technician Gold* arrives.

THE INSTALL-IT-AND-FORGET-IT SOLUTION TO DATA LOSS AND DISK FAILURE.

Once you install new *Disk Technician Gold*, you can forget about hard disk maintenance. Literally. Because *Disk Technician Gold* remembers for you.

A memory-resident device driver *(not* a TSR), *Disk Technician Gold* takes you no time to run at all, because it runs in the background with all your programs. You never have to worry about when to run it.

It requires less than 10K of RAM. And, unlike TSRs, it is safe and reliable.

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Like the original *Disk Technician*, new *Gold* uses the same rigorous soft error tests used by hard disk manufacturers in their own final quality control.

So it will find and repair problems other utilities cannot even detect. While your valuable data is still safe and readable.

No other utility software can do that: Not Norton 5.0. Not SpinRite II. Not PC Tools. Not Optune.

And *Disk Technician Gold* does it automatically. Continuously. Without any intervention on your part. It's like having a self-repairing hard disk.

But, if you want to run any of *Gold's* many powerful tests manually — or need detailed reports — have it your way! With pull-down menus and mouse support.

COMPARE FOR YOURSELF. SIDE-BY-SIDE.

Because new *Disk Technician Gold* works simultaneously with all your programs, now it's easy to compare against Norton 5.0, SpinRite II, PC Tools or Optune.

Just install *Disk Technician Gold*. Then run the other utility's most thorough test. *Disk Technician Gold* will automatically test right along with it. When the test is over, compare the utility's findings against *Disk Technician Gold's*.

That's all the evidence you'll need to retire the other utility permanently.

RUNS ON ANYTHING THAT RUNS ON DOS.

From megabytes to gigabytes, new *Disk Technician Gold* works with any size PC or laptop hard drive running under MS, PC, or DR DOS 3.0 or higher: MFM, RLL, ARLL, SCSI, ESDI, embedded AT and IDE drives. Plus Hardcards. Translating controllers. And any size partition.

MAIN FEATURES

Memory-resident *Disk Technician Gold* does all this *continuously*, while you use all your other programs!

- ✔ Hard disk repair.
- ✔ Preventive maintenance.
- ✔ Data recovery.
- ✔ Down system prevention.
- ✔ Disk crash and hardware failure prediction.
- ✔ Automatic system diagnostics.
- ✔ Virus prevention.

And you get these powerful extras, too!

- ✔ Interleave testing and resetting.
- ✔ Defragmenting/optimizing.
- ✔ Low level formatting.
- ✔ Screen and printed reports.
- ✔ Customizable user interface.
- ✔ Pull-down menus.
- ✔ Hot keys/pop-up status screens.
- ✔ Context-sensitive help.
- ✔ Mouse compatibility.
- ✔ Runs with Windows!

SPECIAL UPGRADE OFFER FOR NORTON, SPINRITE, PC TOOLS & OPTUNE.

Now through January 31, 1991, you can upgrade to new *Disk Technician Gold* direct from the factory for just $60. Nearly $90 off the regular $149.95 price!

AND FOR *DISK TECHNICIAN* OWNERS, TOO.

Until July 1, 1991, registered owners of any *Disk Technician* version can upgrade for only $40. Over $109 off! And if you buy *Disk Technician Advanced* between October 1, 1990 and February 1, 1991, we'll upgrade you to *Gold* absolutely free!

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Or, send this coupon with your check or VISA/MC info to Prime Solutions. Add shipping & handling (Continental USA $5.00; AK, HI, PR & Canada $10.00; all other countries $18.00). California residents, add 7¼% sales tax.

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HIGHLY RECOMMENDED

When Accounting Today (May 1990) asked accountants which accounting software package they recommended to their small business clients, an overwhelming 29% said they recommend Peachtree Accounting– that's almost double the next largest competitor.

Reseller Management (March 14, 1990) asked resellers which accounting package they recommend and Peachtree came out on top again with 25% of resellers recommending it.

But accountants and resellers aren't the only ones giving Peachtree rave reviews·

"If you could find a definition for Peachtree in the dictionary, it might be 'value for your money.'"–PC Magazine 4/10/90

"It is, I believe, the best accounting package available for the price."–E.J. Bosmeny, CPA, Naperville, IL

"Complete III rivals packages costing 10 times as much."–PC Resource, July 1990

If there's one thing people agree on, it's what a great value Peachtree's Double Bonus Bundle is. That's because it includes two first-rate software packages for one low price– Peachtree Complete III, a full-featured accounting system, and Peachtree Data Query III, a reporting and analysis tool.

Peachtree Complete III includes nine high-powered modules to meet all your business accounting needs.

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Peachtree Data Query III gives you custom access to the vital accounting data in your Peachtree Complete III files. Choose from PDQ's predefined reports, customize your own reports (and store the formats for future use), even export data to popular applications like Lotus 1-2-3® and dBASE®, with no risk to your files, and no re-keying of data.

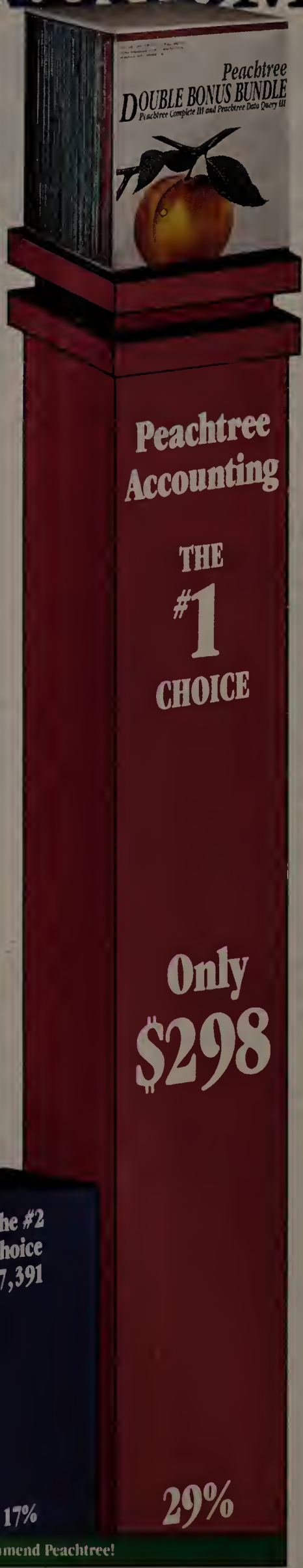
And, Peachtree is the one accounting system you won't outgrow. Install the functions your company needs now and add modules, departments or even companies to the system as your business grows.

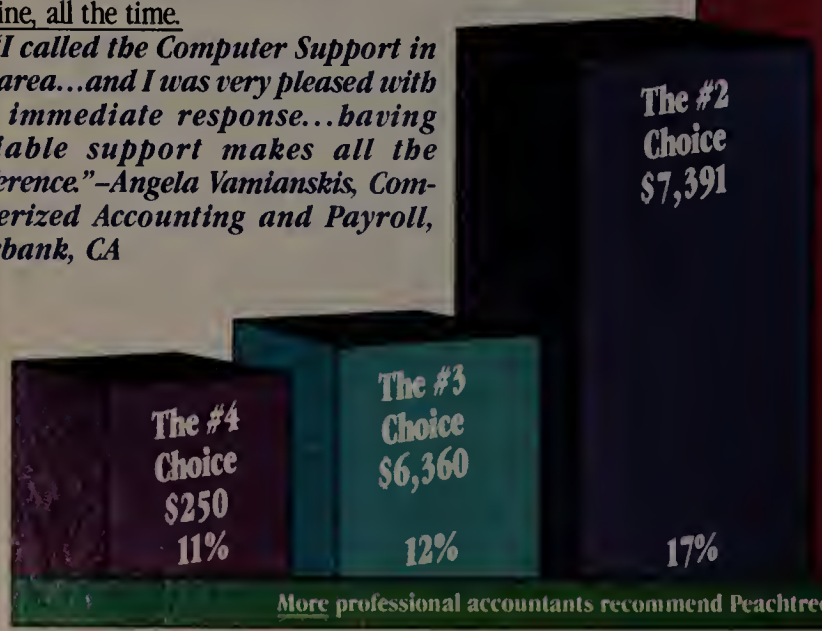
"...It is, beyond a shadow of a doubt, the best, easiest to use, most helpful program I've ever had to review."–C. McQuaid, McQuaid & Holland, Inc., Accountants, Geneva, AL

"Installation is easy, data entry is fast...a joy to use."–PC Resource, July 1990

With Peachtree, you don't have to give up ease of use to get the power and performance you need. The Double Bonus Bundle comes with on-line tutorials for each module and thorough documentation–an Accounting Primer, a quick-start Installation Guide, and a complete reference library–so you can get up and running quickly. Errors are handled with plain English messages and suggestions. Context-sensitive HELP is on-line, all the time.

"I called the Computer Support in my area...and I was very pleased with the immediate response...having reliable support makes all the difference."–Angela Vamianskis, Computerized Accounting and Payroll, Burbank, CA





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"Peachtree Complete III is one of the most full-featured accounting systems in its class."–INFOWORLD February 2, 1990

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- Maintains open item or balance forward customers
- Unlimited transactional detail
- "Ship to" address file

Purchase Orders
- Updates purchase orders and inventory
- Generate A/P invoices from purchase order

Job Cost
- Tracks profitability on a job-by-job basis

Payroll
- Unlimited number of employees
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Hardware Specifications. Requires PC/MS-DOS version 3.0 or higher with 640K of memory and a hard disk. For use with IBM PC, PC XT, PC AT, Personal System/2 and compatibles 3½" media optionally available. Not copy protected. All product prices represent complete accounting systems with modules comparable to Peachtree Double Bonus Bundle.

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"...It's the only application I recommend. The package is superb..."–Marc Barlow, Executive Vice President, AdMedia, Largo, FL

PCW

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three times we called, we were left hanging on hold for between 8 and 14 minutes.

The machine does have its shortcomings: It delivers less-than-thrilling performance, and if you need more than 200MB of mass storage, you'd better have plenty of desk space for external drives. Still, Toshiba's tiny T8500 offers easy internal access, an extra serial port, outstanding service and support, and the lowest price in the review. All in all, this is a decent buy.

Making Tough Choices

While none of these machines provides an ideal combination of price and power, three of them are still quite tempting. Compaq's 386/25e is the best small-footprint 25-MHz 386 money can buy—if money is no object. If you're not willing to drop big bucks, go with the slower Tandy 4025LX; it comes with a few built-in compromises, but its price is a lot more reasonable. Likewise, Toshiba's T8500 Model 25 is a compromise you can live with. It's even slower than the Tandy and holds slightly less fast RAM, and its slots and bays are comparatively less accommodating. Nonetheless, it's the megabargain of the roundup.

On the other hand, if you won't settle for anything less than a Best Buy, sit tight. Small-footprint 25-MHz systems with Compaq performance *and* a Toshiba price will probably be a lot more common six months from now. But remember, too, that by then a new breed of smaller, lower-priced 33-MHz powerhouses will be competing with the 25s for space on your desktop. As the technology gets better, the buying decisions just get tougher.

Scott Spanbauer is a contributing editor for PC World. *Rex Farrance and Susan Lusty contributed research to this article.*

For more information about all products in this article, circle reader service no. 905.

UPGRADES FOR THE '90S #1

800-dpi Laser

The LaserJet Series III is a great deal. But if you're putting out documents that the world will see, you may want more. That's where LaserMaster's Series III Professional Printer Controller comes in. Depending on the board's configuration, you can get 800-by-800-dpi text and graphics output (bit maps are rendered at 800 by 300 dpi), 135 scalable typefaces, PostScript-like effects, and lightning-fast output of text and graphics. Another big plus: The LaserMaster board works with HP's Series II and in other printers based on Canon engines.

Installing the LaserMaster isn't daunting, just time-consuming. Plug the board into your PC, insert an adapter into the LaserJet's I/O port, and connect the two; then connect the printer and PC via a serial or parallel cable. Run the auto-install program, and pour the various drivers, printer fonts, and screen fonts on to your hard disk. Expect to kiss 6MB to 11MB of disk space goodbye.

A LaserMaster-equipped LaserJet is as easy to use as a PostScript printer—and about ten times faster. Simply make 'LaserMaster Direct' the active printer in *Windows 3.0*, open *PageMaker*, and voilà! All the LaserMaster's fonts are at your beck and call. As upgrades go, the LaserMaster isn't the cheapest, but the results are damn impressive. List price: 2MB board with 400 by 400 output and 35 typefaces $1495; same board with 135 typefaces $2495; 4MB board with 800 by 800 output, 135 typefaces $2995; 6MB board with 800 by 800 output, 135 typefaces $3995; MCA versions $500 extra. LaserMaster Corp., 7156 Shady Oak Rd., Eden Prairie, MN 55344-9887; 612/944-9330, 612/944-0522 (fax). —*Robert Luhn*

Reader service no. 734

Robert Luhn is a senior editor for PC World.

311 seconds **95 seconds** **60 seconds**

It's not cheap, but this LaserMaster board offers more fonts than a PostScript printer; 800-dpi output; and blazing speed.

WHERE TO BUY

Compaq 386/25e
Compaq Computer Corp.
P.O. Box 692000
Houston, TX 77269-2000
800/231-0900
LIST PRICE: Model 1 with 4MB RAM, 3½-inch 1.44MB floppy drive, one parallel and one serial port, one mouse port, VGA on the motherboard, 101-key keyboard $5499; Model 60 same as Model 1 but with 60MB hard disk $6399; Model 120 same as Model 1 but with 120MB hard disk $6999
ACCESSORIES: 1MB memory module $149, 4MB memory module $1599, 1MB memory expansion board $499, 4MB memory expansion board $1999; 40MB hard disk $899, 110MB hard disk $1799, 320MB hard disk $5899; 360K floppy drive $275, 1.2MB floppy drive $275, 1.44MB floppy drive $275; 80/120MB tape drive $899; 25-MHz 80387 coprocessor $1399, Weitek 3167 coprocessor $1499; 14-inch VGA color monitor $699, 16-inch advanced graphics color monitor $1699; advanced graphics 1024 board $1299; DOS 4.01 $150, OS/2 1.21 $340
WARRANTY: one year parts and labor, carry-in
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TECHNICAL SUPPORT: through dealer
OTHER SUPPORT: none
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WARRANTY: one year parts and labor, carry-in
EXTENDED WARRANTY: through dealer
TECHNICAL SUPPORT: through dealer
OTHER SUPPORT: in-house BBS
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NEC Technologies, Inc.
1414 Massachusetts Ave.
Boxborough, MA 01719
800/632-4636
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ACCESSORIES: 2MB CPU-speed RAM $499, 8MB CPU-speed RAM $1499; 42MB hard disk and controller $800, 100MB 3½-inch hard disk and controller $1700, 140MB 3½-inch hard disk and controller $1900; 360K floppy drive $300, 1.2MB floppy drive $199, 1.44MB floppy drive $199; 150MB tape drive $1399; 25-MHz 80387 coprocessor $1199; 800 by 600, 16-color super-VGA adapter $250; NEC MultiSync 2A color VGA display $799; DOS 4.01 $130, OS/2 1.0 $325
WARRANTY: one year parts and labor, carry-in
EXTENDED WARRANTY: through dealer
TECHNICAL SUPPORT: through dealer
OTHER SUPPORT: in-house BBS
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Tandy 4025LX
Tandy Corp.
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Fort Worth, TX 76102
817/390-3011
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ACCESSORIES: unpopulated RAM board $100, 1MB RAM $300, 2MB RAM $500; 105MB IDE hard disk $899, 80MB SCSI hard disk $999, 440MB SCSI hard disk $2599; 360K floppy drive $170, 720K floppy drive $140, 1.2MB floppy drive $170, 1.44MB floppy drive $170; 160MB internal SCSI tape drive $1099; 25-MHz 80387 coprocessor $814; monochrome VGA display $200, color VGA display $500; PS/2 mouse $50; DOS 4.01 $140; Windows 3.0 $149
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EXTENDED WARRANTY: through dealer
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ACCESSORIES: 2MB RAM module $999, 8MB RAM module $3999; 100MB hard disk expansion kit $1199; external 360K floppy drive $499; 80MB external tape drive $1049; DOS 3.3 $99, OS/2 1.1 $325, BASIC 3.0 $75
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EXTENDED WARRANTY: available
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Eric Knorr
Editor

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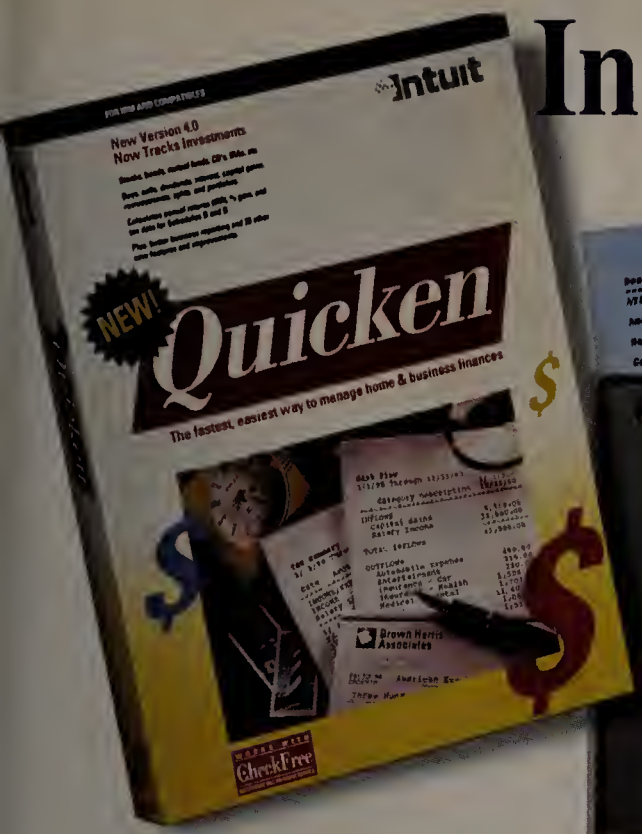

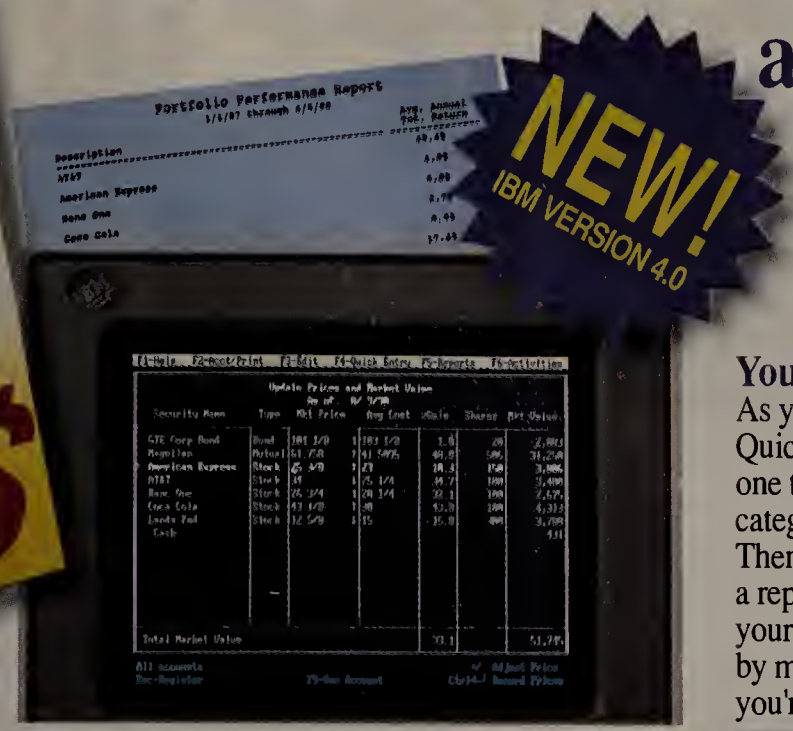

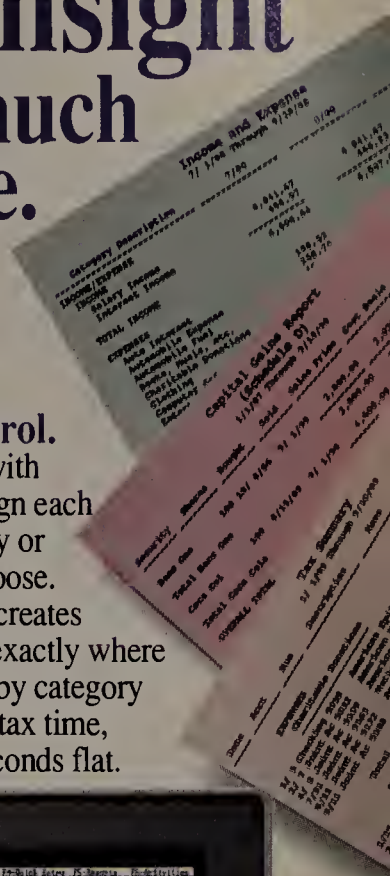

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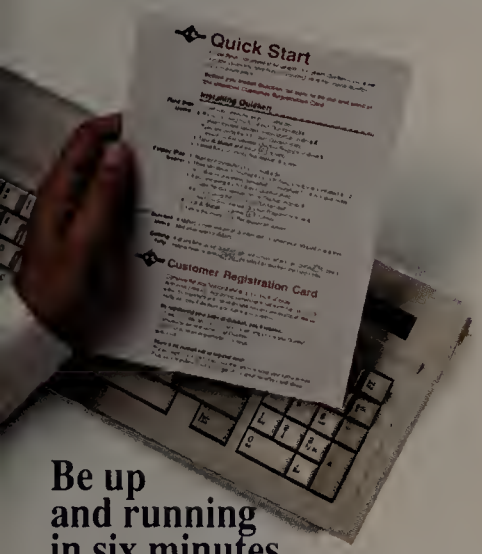

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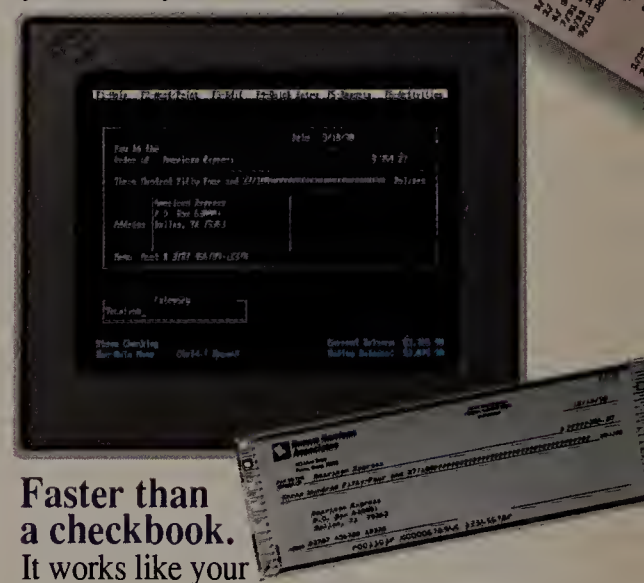

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386/33 Cache Super VGA	• 4 Mb RAM • 125 Mb/19 Ms hard drive with caching controller • 32K RAM cache • 14", 1024 x 768 Super VGA color monitor • 16 bit VGA with 512K • High resolution mouse	BUYERS ASSURANCE SEAL INFO WORLD RECOMMENDED PRODUCT	*"PC Brand's 386/33 has flawless compatibility, lowest price"* **-InfoWorld** *Product Review*	**$3,374**
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If you're thinking about utilities, consider the utilities that do the thinking for you.

The Norton Utilities® 5.0 is more than just a powerful new version of a classic, award-winning bestseller.

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That's because the people who brought you the legendary *UnErase*® and the revolutionary *Norton Disk Doctor*® have cooked up another remarkable innovation.

Intelligence.

It's built in to each and every one of the 20 utilities in this package.

Which means that each and every person who uses a PC—yes, even outright novices—can use the Norton Utilities to perform a variety of sophisticated support tasks.

The new Norton Utilities corrects problems other programs can't even detect. File Fix, *for example, fully reconstructs damaged 1-2-3, Symphony® and dBase files.*

Without the aid of a sophisticated support person.

Whether you want to maximize your PC's performance, minimize the chances of data loss and disk failure, or just get yourself out of a jam, you need to get yourself the new Norton Utilities.

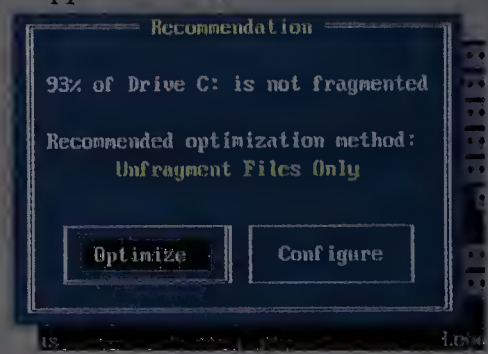
Having the Utilities on your disk—or on your network—is like having Peter Norton at your elbow.

In fact, our enhanced user interface includes a unique new feature that works with you just the way Peter would.

Advise not only helps you identify your particular problem, it also recommends the appropriate course of action and executes the appropriate utility.

Automatically.

If the problem happens to be a corrupted hard disk, you'll see right away why the *Norton Disk Doctor II* is the most sophisticated utility of its kind in the world.



Now everyone from novices to experts can safely perform in-depth preventative maintenance and file recovery with a few simple mouse clicks.

Disk Doctor II finds and fixes problems other programs can't even detect. Yet it's simple enough for beginners to use.

The same goes for *File Fix*,™ an invaluable new tool that delves into the complex internal structure of your Lotus® 1-2-3,® dBase® and compatible spreadsheets and databases to make repairs that would stymie even a skilled technician.

UnErase performs data searches automatically and shows you a list of all the deleted files on your disk. So all you have to do is point and shoot.

It also does something no other program can do: recover deleted files from anywhere on your network.

If all of that sounds like reason enough to join the army of happy Norton Utilities users, it is.

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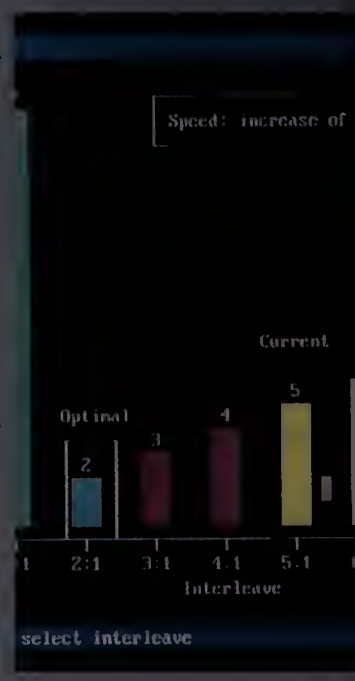

Our new Calibrate *utility revitalizes demagnetized disk areas and uses a low-level formatter to adjust your disk when the heads go out of alignment.*

It not only offers four different optimization methods, it figures out exactly how fragmented your disk has become and tells you which method to use.

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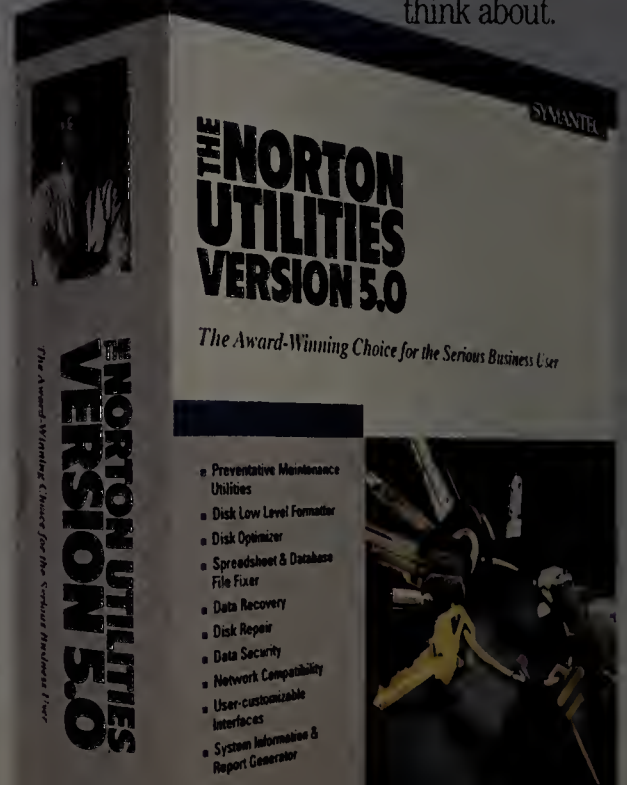

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HARDWARE SPECIAL ISSUE

PostScript Printers: Great Fonts Faster Than Ever

Looking for a printer that can meet the high demands of today's top graphics applications yet still serve your work group? We examine six heavy-duty PostScript printers that combine graphics flair with network functionality.

Ross Smith and Daniel Tynan

STEPHEN RAHN

With a fast RISC processor, ample font-storage options, and the highest resolution you can get in its price range, the NewGen TurboPS/480 is an easy Best Buy. At a street price of $6572, it's not inexpensive, but you won't find a more capable network PostScript printer.

Today's graphical applications give you lots of tools for dressing up your documents, but without the right printer, you can't take them anywhere. You can get by with a LaserJet Series II and a handful of soft fonts or a PostScript cartridge, or you can invest in the font-scaling Series III. But if you need to print large volumes of complex documents containing sophisticated images and a broad assortment of fonts, a LaserJet isn't enough.

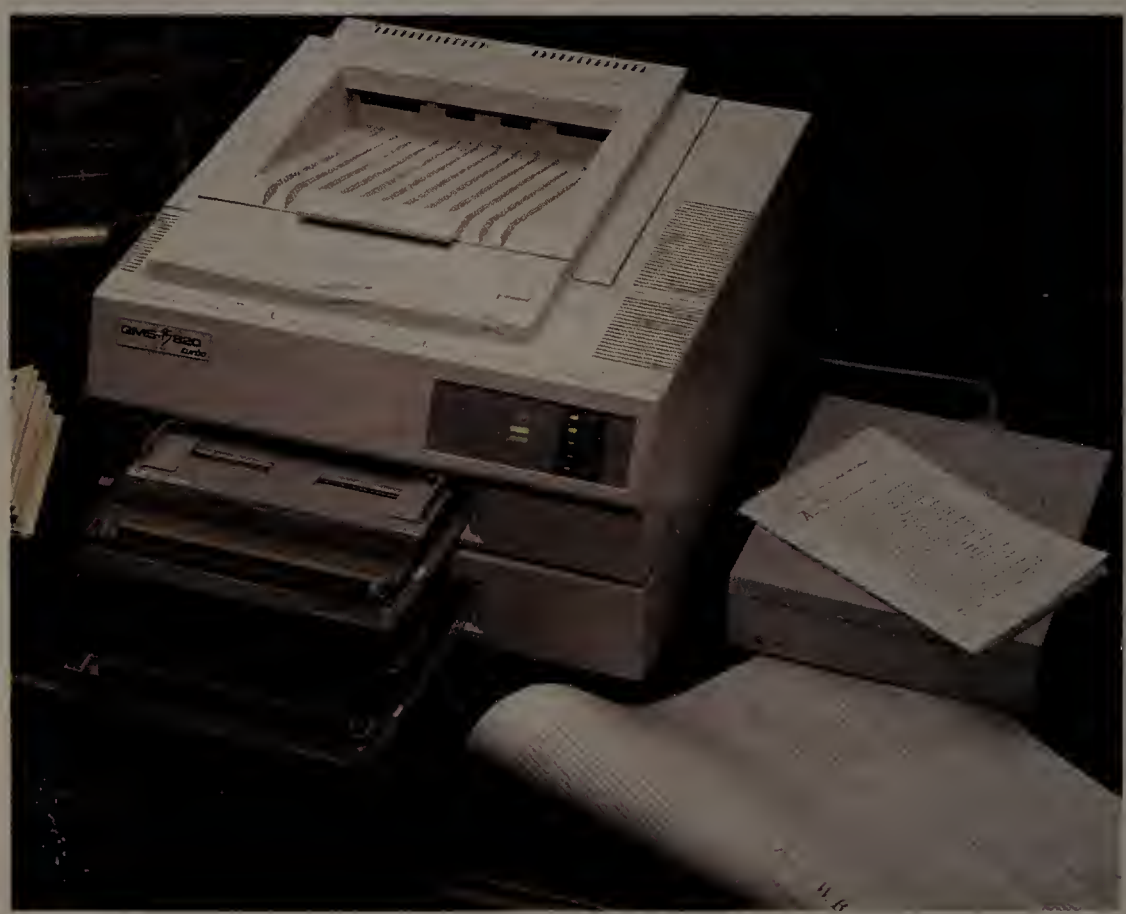
The PostScript printers reviewed here give you the whole package: a slew of scalable typefaces, unbeatable graphics capabilities, and a time-tested PostScript standard that's supported by virtually every application and by high-resolution imagesetters. Moreover, the machines' ability to emulate the HP LaserJet proves that PostScript printers aren't just for desktop publishers anymore. In the graphical nineties, a PostScript device may be the only printer you'll need.

We looked at six PostScript printers that promise the power to support busy work groups. Most of the printers offer 300-dot-per-inch (dpi) resolution and rely on PostScript interpreters licensed from Adobe Systems, the creator of this page description language. All come with at least 35 built-in typefaces, accept Adobe Type 1 downloadable fonts, and pack enough RAM to handle the heap of fonts and graphics a work group is sure to send their way.

Is your document being processed? A flashing green light (inset) is your only indicator—the Apple LaserWriter IINTX provides neither an LCD readout nor front-panel controls.

Two printers break the mold and deliver the best bargains. NewGen's 800-by-400-dpi TurboPS/480 and Qume's 600-by-300-dpi CrystalPrint Express not only offer higher resolutions but are built around ultrafast RISC processors. On the basis of speed and output quality, the NewGen and the Qume beat all comers. The Qume, however, takes second place to the NewGen, whose sharper output and hard disk option for storing extra fonts clearly make it the Best Buy for those who need a network graphical printer.

Neither of these printers uses Adobe-licensed PostScript, the absolute guarantee of PostScript compatibility. However, all nonlicensed printers in this roundup passed our rigorous PostScript compatibility tests without a glitch. If you still insist on the Adobe seal of approval, your best bet here is the QMS-PS 820 Turbo, which offers relatively fast operation and a hard disk option. Better still, wait for high-speed Adobe-licensed RISC printers, which should be available by mid-1991.



STEPHEN RAHN

The QMS-PS 820 Turbo has solid network credentials, including multiple paper trays and an interface for hooking up a SCSI hard disk (such as the Apple drive shown here).

Goodbye LaserWriter, Hello NewGen

Only the NewGen TurboPS/480 combines superior font storage options with fast, RISC-based processing and the highest resolution in its class—an unbeatable combination.

● Yes
○ No
◒ Deficient

	Apple LaserWriter IINTX	Kyocera Q-8010	NewGen TurboPS/480	QMS-PS 820 Turbo	Qume CrystalPrint Express	Texas Instruments Omnilaser 2115
Standard features						
Street price [1]	$4712 [2]	$6287 [3]	$6572 [3]	$5874	$4293 [4]	$6398 [5]
List price [1]	$7087 [2]	$7074 [3]	$7584 [3]	$7565	$5724	$8064 [5]
Rated engine speed (ppm)	8	10	8	8	12	15
Duty cycle (pages per month)	5000	10,000	5000	10,000	10,000	25,000
Engine life (pages)	300,000	n/a	300,000	600,000	600,000	1.5 million
Processor	Motorola 68020	Motorola 68020 [6]	Intel 80960KB	Motorola 68020	Weitek XL 8200	Motorola 68000
Cost of toner cartridge	$129 [7]	$36.95	$195 [7,8]	$130 [7]	$27	$39.50
Estimated cost per page (cents)	3.7	2.9	3.2	3.25	2.9	2.64
Maximum resolution (dpi)	300	300	800 by 400	300	600 by 300	300
Standard/maximum RAM	2MB/12MB	5MB/6MB	5MB/5MB	2MB/8MB	3MB/8MB	3MB/3MB
Interfaces						
Parallel	○	●	●	●	●	●
Serial	●	●	●	●	●	●
AppleTalk	●	●	●	●	●	●
Font options						
Number of standard scalable typefaces	35	35	35	39	39 [9]	35
Accepts Adobe Type 1 fonts	●	●	●	●	●	●
Accepts Adobe Type 3 fonts	●	●	●	●	●	○
Accepts third-party downloadable fonts	●	●	●	●	●	●
Accepts font cartridges	○	●	●	○	○	●
Provides hard disk interface	●	○	● [10]	●	○	○
Emulations						
HP LaserJet Series II	◒ [11]	●	●	●	●	●
HP LaserJet Series III	○	○	●	○	○	○
HP 7475A plotter (HPGL)	○	○	●	●	○	●
Epson FX	○	○	●	○	○	○
Diablo 630	●	●	●	○	○	●
Paper handling						
Standard/maximum capacity (sheets)	200/200	250/250 [12]	200/200	400/400 [12]	500/500	500/500
Dual cassette	○	○	●	●	●	●
Envelope printing	●	●	●	●	●	○
Label printing	●	●	●	●	●	●
Transparencies	●	●	●	●	●	●
			BEST BUY			

[1] Includes 4MB RAM; letter- and legal-sized paper trays; and parallel, serial, and AppleTalk ports (if available).
[2] Price includes 6MB RAM.
[3] Price includes 5MB RAM.
[4] Estimate based on average street-price discount.
[5] Price includes maximum 3MB RAM.
[6] Includes Motorola 68881 math coprocessor.
[7] Integrated toner, drum, and developer.
[8] Cost of high-resolution cartridge; normal-resolution cartridge $129.
[9] Also provides 31 scalable, rotatable typefaces in PCL mode.
[10] Available for $149.
[11] Emulates LaserJet Plus.
[12] Optional 1000-sheet paper feeder available.

BUYING SMART: FINDING THE RIGHT LAN-DUTY POSTSCRIPT PRINTER

A network-duty PostScript printer should be dependable, expandable, and fast, as well as able to handle a big work load and to switch easily between PostScript and LaserJet emulations. The good news is that the most powerful printers aren't necessarily the most expensive. Here's what to look for:

Speed Graphics files can really bog down a network printer, so fast output is crucial. With simple text printing, the key element is engine speed (usually rated in pages per minute, or ppm); with calculation-intensive font scaling and graphics composition, it's the speed of the processor. The RISC-based Qume and NewGen have a big advantage here, blazing through most of our speed tests despite placing more dots on the page. The 300-dpi QMS-PS 820, powered by a Motorola 68020 processor, finished a strong third.

Output Quality If a PostScript printer doesn't give you razor-sharp text and graphics, why buy it? Look for crisp text and distinct lines, solid black fills, and reversed (white-on-black) text that's easy to read. All the 300-dpi printers generated superior output, but the high-resolution Qume had difficulty reversing text. Overall, none could match the quality of the 800-by-400-dpi NewGen.

Font Options Even 35 fonts may not be enough to satisfy every user on your network. Demand plenty of RAM for downloading extra typefaces, a healthy selection of add-in font cards or cartridges, or—best of all—a hard disk option for auxiliary font storage. A hard disk lets you download a huge number of fonts just once, then access them as if they were resident in the printer. (List prices for dedicated 20MB disks range from $699 to $999.) With their SCSI hard disk interfaces, the Apple, NewGen, and QMS printers top this category.

LaserJet Emulation Because some applications still don't support PostScript, your graphical printer should provide flawless LaserJet emulation—and, ideally, switch between PostScript and HP modes automatically. All the units easily handled files formatted for the LaserJet Series II, though none offer full Series III emulation. Unfortunately, none of the printers can switch modes automatically—you have to send an escape code to the printer or use the printer's front-panel controls. This could wreak havoc in a network environment, where a printer set to the wrong mode can produce pages full of garbage.

Qume says it's solved half the problem: The CrystalPrint returns automatically to PostScript mode after printing a PCL file. Unfortunately, the unit we reviewed was unable to perform as claimed. And remember: All but the Kyocera require you to redownload fonts and macros every time you switch modes.

Paper Handling A network printer can never have enough paper or paper-handling options. Demand at least one 200-sheet paper cassette (two are preferable) and the ability to accommodate letter- and legal-sized paper, envelopes, and labels. With its dual 250-sheet paper trays and envelope-printing skills, the Qume CrystalPrint nudges out the Texas Instruments OmniLaser 2115 as paper-handling champ. If you need even greater paper capacity, consider investing in a 1000-page sheet feeder (QMS and Kyocera offer feeders costing $795 and $895, respectively).

Installation and Maintenance You want a printer that's fairly easy to install and maintain over the long haul. Look for easy-to-replace toner cartridges, accessible memory slots, and front-panel controls with an LCD display. A hefty duty cycle is also a must, but remember that the figures given here are vendor estimates; the printer's actual performance may vary. The TI's impressive 25,000-page monthly duty cycle indicates the greatest durability.

Price This roundup features street prices based on a survey of dealers across the country. Rather than averaging the selling prices of stripped-down models, we based our street prices on a recommended configuration for network duty: 4MB of RAM, at least one letter- and one legal-sized paper tray, and (if available) a combination of one serial, one parallel, and one AppleTalk port. In cases where street prices were unavailable, we based estimates on the average discount. —*R. S. and D. T.*

Apple LaserWriter IINTX

Only a short time ago, the Apple LaserWriter IINTX was *the* standard for office PostScript printers. But times have changed. Though capable of top-notch PostScript output and excellent font handling—and relatively inexpensive at a street price of $4712—the IINTX isn't the speediest printer. Feature for feature, the QMS-PS 820 is a better Adobe PostScript machine.

The LaserWriter lacks a parallel port—never had it, never will—and as a serial port device, the IINTX is abominably slow. Fortunately, you can install a

$299 AppleTalk interface card in your print server, which cuts print time in half. With one, the IINTX still lands in the middle of the pack for text and graphics printing. Output quality is good but no match for that of the Qume or the NewGen.

Otherwise, the IINTX provides the features required in a heavy-duty workgroup printer. You can install up to 12MB of RAM, and you can daisy-chain up to seven external hard disks to its SCSI interface for storing massive font libraries. The LaserWriter uses the durable Canon SX engine and provides a slot for a 200-sheet paper cassette or a 15-sheet envelope tray. About the only feature missing is a second paper feeder.

Switching between emulations is relatively simple—just type a mode-switching command before printing. But installing the AppleTalk interface is an added hassle, and the printer's lack of front-panel controls or LCD display means that you're printing blind, guided only by a flashing indicator light.

In short, the LaserWriter is expandable and highly capable. But it's no longer the Apple of a PC user's eye.

Kyocera Q-8010

On paper, the Kyocera Q-8010 looks impressive: It's the only printer that includes a math coprocessor to chew on calculation-intensive PostScript operations (such as generating curves), and it offers a creative approach to handling PostScript and HP files. But it's the second slowest printer in the roundup, and its font options are minimal. There just isn't enough here to justify the Q-8010's $6287 street price.

The 10-ppm Q-8010's print quality is good, but if you're looking for room to grow, you may be disappointed. The Q-8010 offers a maximum of 2MB of available RAM for downloaded fonts, yet there's no SCSI hard disk port, and cartridge options are limited to three typeface families for $325 each.

The Q-8010 does take a clever approach to networking. The printer's serial, parallel, and AppleTalk interfaces can each be configured for a different emulation, and all can receive data simultaneously. Switching from PostScript to LaserJet mode requires just a few simple software commands, and the Kyocera is the only reviewed printer that maintains downloaded fonts and macros when you switch emulations. One 250-sheet paper tray and a respectable 10,000-page monthly duty cycle round out the package.

The Q-8010 is a unique machine with solid networking capabilities. But it lacks the power and expandability to shine as a network PostScript printer.

NewGen TurboPS/480

The RISC-based NewGen TurboPS/480 offers the highest resolution of any printer in this survey and rates near the top in overall speed. With its top-flight output and support for an optional SCSI hard disk, it's worth every penny of its $6572 street price. The

UPGRADES FOR THE '90S #2

Keyboard of a Thousand Faces

Finding a keyboard you like is tough enough; finding one that actually evolves as your work changes has been—until now—impossible. But thanks to the crafty folks at Datadesk, there's the Switchboard, a modular keyboard that lets you snap in a trackball, a keypad with 15 function keys, or an IRMA/3270 function keypad. The Switchboard even works with a Mac.

Installation is simple: Open a compartment on the keyboard, set a few DIP switches, and plug the keyboard into your machine. If you want to replace a module or move the installed modules around, just flip up the keyboard, push the appropriate button, and up pops the module. Unplug the data cable, and you're ready to mix and match.

The Switchboard features the famous snappy action you might expect from Datadesk, as well as the ability to swap the <Caps Lock> and <Ctrl> keys. The company plans to release other modules, including an LCD calculator, a numeric keypad for accountants, a digitizing table, a Dvorak keyboard, and more. List price: $239.95, trackball module $149.95, 15-function keypad $49.95, 3270/Macro Key module $99.95. Datadesk Int'l, 9314 Eton Ave., Chatsworth, CA 91311; 800/826-5398, 800/592-9602 (California), 818/998-0330 (fax). —*Robert Luhn*

Reader service no. 733

Pick your module and snap it in—this mix-and-match keyboard accommodates almost any taste.

TONY CARLSON

NewGen easily rates the Best Buy of the roundup.

The PS/480 uses a proprietary PostScript interpreter, but unlike the Kyocera's, it's fast. The PS/480 placed just behind the Qume CrystalPrint in overall speed—especially impressive, considering that at 800 by 400 dpi it prints nearly twice as many dots on the page as the 600-by-300-dpi Qume. Text printing at the high resolution was less spectacular—the PS/480 finished last—but crank back resolution to 400 by 400, and you can improve speed on long text documents by 50 percent.

The NewGen's output is the best we've seen. NewGen even sells special high-resolution and high-density toner cartridges, for crisper text and graphics and denser black areas. The result is output approaching that of 600-dpi imagesetters for about half the price.

The Qume CrystalPrint Express produces fast, high-resolution output, but don't bother looking for a hard disk interface or font cartridge slots—there aren't any.

Don't need higher resolution? NewGen also sells RISC-based 300- and 400-dpi printers at prices lower than any of the others reviewed here.

The PS/480 tops out at 5MB of RAM, of which only 1MB is available for downloaded fonts. However, an optional $149 SCSI interface lets you add a dedicated hard disk. Serial, parallel, and AppleTalk interfaces are standard, as are software-switchable LaserJet, HPGL, and Epson LQ-800 printer emulations. The PS/480's Canon SX engine is rated conservatively at 5000 pages a month, but Hewlett-Packard, which uses a 300-dpi version of the same engine in its LaserJet III, gives it a maximum monthly rating of 16,000 pages—plenty for most network users. One drawback: The lack of a second paper cassette means you might want to buy a third-party sheet feeder.

At this price, the NewGen TurboPS/480 sets a new standard for performance and print quality. When you get into this range of resolution, you have more than a printer, you have a network imagesetter—and a *PC World* Best Buy.

POSTSCRIPT REACHES A NEW LEVEL

Lost June, Adobe unveiled PostScript Level 2, o leaner, more capable version of its industry-standard poge description longuoge. The new PostScript promises faster output, more memory for downloaded fonts, and the ability to tockle complex graphics thot would choke o Level 1 printer. Other enhoncements are clearly oimed at moking developers' lives easier. Insteod of creoting functions from scrotch (for drowing o box, soy), developers con coll on functions built into the Level 2 longuoge. PostScript Level 2 drivers olso should be eosier to write ond less prone to error. The end result should be foster programs with fewer bugs. The only catch? The first Level 2 printers won't be ovoilooble until sometime in 1991.

The bigger question is whether you'll be oble to upgrade your current PostScript printer to Level 2. The answer from most vendors is o cautious maybe. The new PostScript likely will require more ROM chips than many printers hove room for, which means you may have to reploce the entire printer controller. However, don't turn that old PostScript printer into a boat onchor. Since Level 2 supports all Level 1 commands, your printer con still churn out files from applicotions thot rely on Level 2 drivers. You just won't get the performance gains that a Level 2 printer offers.

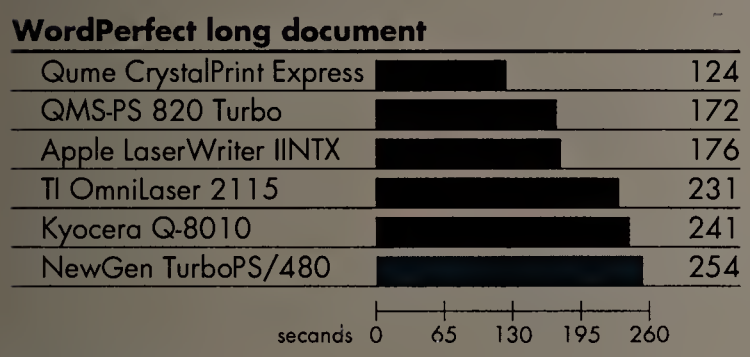
At present, how lorge a speed boost Level 2 will deliver is unknown, and the current version of PostScript con still handle just obout ony graphic you throw at it. But as your use of complex text ond images grows—ond as grophics applicotions ore rewritten to take full odvontoge of PostScript's new copabilities—you moy want to move up o level. —*D. T.*

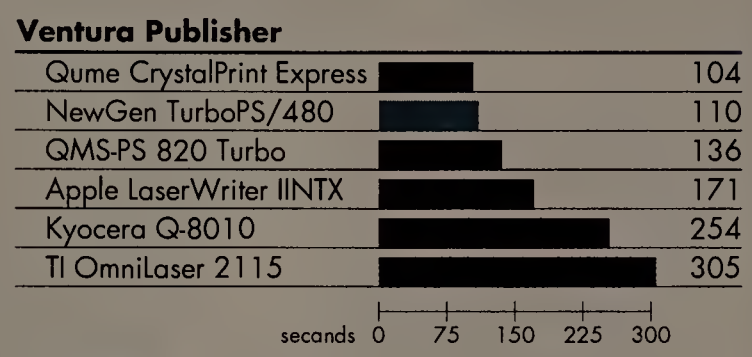
STEPHEN RAHN

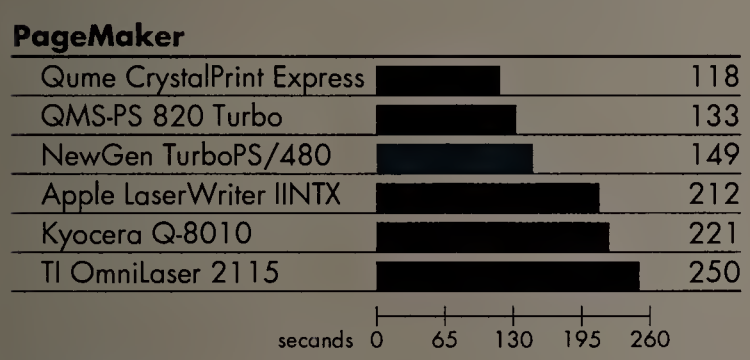
High-Resolution Printers Trounce 300-dpi Machines

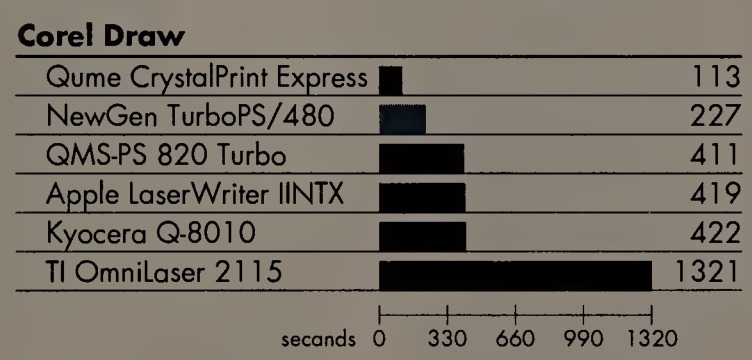
Even at 600 by 300 dpi and 800 by 400 dpi, respectively, the Qume and NewGen PostScript printers easily outperform the competition when printing complex graphics, thanks to their super-fast RISC processors.

Best Buy









Methodology
Benchmarks were conducted using a 12-MHz Campaq Deskpra 286 Madel 40 equipped with 640K af canventianal RAM and 2MB af extended RAM. The Apple LaserWriter IINTX was tested attached ta a LacalTalk card; if the printer were cannected serially, the benchmark times wauld be twa ta three times slawer. The Qume CrystalPrint Express and the NewGen TurbaPS/480 were tested at their highest resalutian settings. All the test files were printed ta disk and then capied ta the printer fram a 2MB extended-memary RAM disk. Timing began when the print cammand was issued, and ended when the last page came ta rest in the autput tray. Print times far text and TIFF files were 5 ta 10 percent faster far all printers the secand time the same print jab was run.

WordPerfect long document
An entire 20-page *WardPerfect 5.1* dacument that cantains multiple types and sizes af fants, twa tables, single- and dauble-line draw characters, and shading is printed.

PageMaker
A ane-page *PageMaker 3.0* newsletter cantaining multiple types and sizes af fants, charts, tables, and a TIFF file is printed.

Ventura Publisher
A *Ventura Publisher 2.0* page that includes a scanned image, bar charts, line drawings, and text set in variaus sizes af Helvetica is printed.

Corel Draw
A page created in *Carel Draw 1.2* cansisting af samples af camplex, detailed, highlighted, and shaded clip art is printed.

Data based on tests designed and conducted by National Software Testing Laboratories (NSTL), Conshohocken, PA 19428. All rights reserved.

QMS-PS 820 Turbo

QMS's top-of-the-line PS 820 Turbo fulfills all the requirements for a network printer and then some. It sports a fast processor, good output, and the Adobe stamp of approval. If you must have an Adobe-licensed printer, this $5874 model is the choice—but it can't match the NewGen's output quality.

Thanks to a 20-MHz Motorola 68020 processor, the PS 820 vied with the NewGen TurboPS/480 for second place in overall speed, and even bested it in text printing. (Note, however, that the NewGen prints at better than three and a half times the PS 820's resolution.)

The QMS comes with 39 fonts (the standard 35 plus a Helvetica Condensed family) and 2MB of RAM, expandable to 8MB. As with the LaserWriter, a SCSI hard disk interface is standard. And the PS 820 Turbo has what the LaserWriter lacks: a parallel port to go with its serial and AppleTalk interfaces.

The QMS emulates HPGL plotters as well as the LaserJet; both are software selectable. The PS 820 Turbo is fairly easy to set up and operate, but you'll have to place a MODE=LPT1:,,P command in your AUTOEXEC.BAT file—something not mentioned in the manual. Dual 200-sheet paper-tray options and a 10,000-page monthly duty cycle solidify its position as a durable network printer.

The QMS-PS 820 Turbo is probably

the fastest Adobe PostScript printer available in this price range, with all the features required for network use. Although it can't match the speed of the RISC-based printers, if guaranteed PostScript compatibility is your primary concern, the QMS is a good buy.

Qume CrystalPrint Express

The high-resolution Qume CrystalPrint Express is one of the fastest PostScript printers you'll find anywhere, and at an estimated street price of $4293 it's the least expensive printer in the roundup. But its lack of font expandability and hard disk options pushes it out of the winner's circle.

With a Weitek RISC chip and a proprietary PostScript interpreter, the 12-ppm Qume CrystalPrint Express blazed through all our speed tests, finishing first at both 300-dpi and 600-by-300-dpi resolutions. Although the printer does a poor job of printing reversed text, print quality at Qume's highest resolution was generally superior to all but the NewGen's output.

The CrystalPrint Express comes with 39 fonts (the standard 35 plus Helvetica Light & Black) and 3MB of RAM, expandable to 8MB. But there are no provisions for auxiliary font storage, on either font cartridges or an optional hard disk, which is almost mandatory with a heavy-duty network printer.

The CrystalPrint Express has all the other essential network features: serial, parallel, and AppleTalk interfaces, dual 250-sheet paper cassettes, and a 10,000-page duty cycle. Its LaserJet emulation is especially impressive, offering 31 *scalable* typefaces and the ability to rotate text. Qume also claims the printer will return automatically to PostScript mode after a LaserJet document is printed. Unfortunately, we couldn't get this feature to work. Qume says the problem should be solved by the time you read this, which should make the CrystalPrint Express a formidable network printer indeed.

The CrystalPrint Express has most of the qualifications for a network PostScript printer, including outstanding speed and an excellent price, but it stumbles in font handling and emulation switching. It's a good buy, but not the best.

Texas Instruments OmniLaser 2115

With a brawny 15-ppm Ricoh engine and robust paper handling, the $6398 TI OmniLaser 2115 seems like the ideal network printer. Unfortunately, under the hood of this Cadillac-priced printer is a Volkswagen motor. The OmniLaser is fine when printing long stretches of text, but it has a hard time making it up those steep graphics hills. Sleeker PostScript models have passed it right by.

Powered by a lightweight 10-MHz Motorola 68000 processor, the OmniLaser pushes out multiple pages of text reasonably fast but finished dead last in printing graphics. Output quality was good, but the printer itself was temperamental: Sometimes a document would print out, other times it would disappear

UPGRADES FOR THE '90s #3

Double Your Hard Disk

If hard disk space is running short but you lack a Fortune 500 budget, InfoChip's $199 Expanz "disk expander" card could be your low-cost solution. Plug this board into your PC, and you can double or even triple the space available on any hard disk. The secret is a data compression chip that shrinks and expands files on the fly. How much space you gain depends on the files involved. Expanz can condense some data base files to an eighth of their size; document files can be halved. In a test AT equipped with a 20MB drive, the Expanz "found" an extra 13MB.

Be forewarned: The Expanz needs another round of tweaking before it's ready for the mass market. Although installation is relatively painless and the board works transparently, it balks at Compaq DOS 3.31, DOS 4.xx, and bootable disk partitions exceeding 32MB. And while Expanz's data compression technique won't slow your drive down, performance will degrade over time because the board doesn't work with disk optimizers, defraggers, or unerase/unformat utilities. The Expanz can be a space saver: Just make sure you can live within its limits. List price: $199. InfoChip Systems Inc., 2840 San Tomas Expwy., Santa Clara, CA 95051; 800/447-0200, 408/727-4190 (fax). —*Robert Luhn*

Reader service no. 732

Scrounging for megabytes? The Expanz card can double or triple storage—and you just plug it in.

TONY CARLSON

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EXECUTIVE SUMMARY

NewGen PS/480: Fast, Fabulous PostScript Output

The best of these PostScript printers offers speed, super resolution, and the power to handle heavy-duty work loads.

Now that most word processors and graphics packages support PostScript, you can buy a network-duty PostScript printer and give your whole work group easy access to scalable fonts and sophisticated graphics. That's good news if your office relies on Windows, OS/2, or anything else graphical. And thanks to recent improvements, you don't have to settle for slow print speed or ho-hum 300-dpi resolution.

NewGen's Turbo PS/480 easily captures the Best Buy ribbon, based on a combination of outstanding print quality (800 by 400 dpi), performance, and PostScript compatibility. The printer also features good font options, including an optional hard disk interface and the hardy Canon SX engine. The **Qume CrystalPrint Express** offers the fastest output, 39 internal fonts, and up to 8MB of RAM—but it can't match the **Turbo PS/480's** print quality or font options.

	Apple LaserWriter IINTX	Kyocera Q-8010	NewGen Turbo PS/480	QMS-PS 820 Turbo	Qume CrystalPrint Express	TI OmniLaser 2115
Performance	Fair	Fair	Excellent	Good	Excellent	Poor
Print quality	Good	Good	Excellent	Good	Good	Good
Font options	Excellent	Fair	Excellent	Excellent	Fair	Fair
Paper handling	Fair	Fair	Fair	Good	Excellent	Good
LaserJet emulation	Good	Good	Fair	Good	Fair	Good
Installation and maintenance	Fair	Good	Good	Good	Good	Fair
Price	Excellent	Fair	Fair	Good	Excellent	Fair
Overall value	Good	Fair	Excellent	Good	Good	Fair
			BEST BUY			
Reader service no.	795	796	797	799	800	801

How we rate PostScript printers
We rate these printers based on information in the Features Table and the PC World Test Report, combined with our opinions of quality, reliability, and user benefit.

Performance measures overall speed in printing a variety of text and graphics files. Performance is the primary consideration for heavy-duty PostScript printers. The printers that require the least amount of time to print the files receive an Excellent rating.

Print quality is a subjective analysis of how good the output looks. To receive an Excellent rating, the printer must produce sharp fine lines and crisp text free from jagged edges. Black areas must be solid black, with no signs of smearing or fading, and white text on a black background should be sharp and easily readable. Special consideration is given to the crispness of the text and images produced by printers exceeding 300-dpi resolution.

Font options rates the number and availability of printer fonts. An Excellent rating in font handling means the printer provides the minimum 35 standard PostScript internal typefaces plus support for Adobe Type 1 soft fonts, sufficient RAM capacity for downloading at least two additional typeface families, and a hard disk interface for auxiliary font storage.

Paper handling refers primarily to paper capacity plus expansion options. An Excellent printer must handle letter- and legal-sized paper, envelopes, and labels, and provide two easily refilled paper cassettes with at least 200 sheets each for network operation.

LaserJet emulation measures the printer's ability to imitate a LaserJet Series II and switch between emulations. An Excellent printer should provide flawless LaserJet emulation, display the current mode on an LED panel, and switch automatically between PostScript and LaserJet modes. Because none of the printers provides automatic switching, no Excellent rating was awarded.

Installation and maintenance is a subjective evaluation of how easy it is to set up and operate the printer, and of the printer's ability to handle a heavy work load. An Excellent printer provides front-panel controls and an LED display, easy access to consumables and memory slots, good documentation, and a monthly duty cycle of at least 10,000 pages.

Price ratings are awarded by calculating the standard deviation from the average street price.

Overall value weighs all of the above criteria, plus the price of the printer.

into a digital black hole.

The TI's font options also leave you wanting. You're stuck with 3MB of RAM maximum, there's no hard disk option, and though two cartridge slots are provided, you get only one typeface family per $329 cartridge—hardly a bargain.

On the bright side, the TI is a rugged machine with great paper-handling options, though it won't accept envelopes. It features an impressive 25,000-page duty cycle and comes with dual 250-sheet paper cassettes you can fill without having to remove them from the

printer. Parallel, serial, and AppleTalk interfaces are standard, and the printer provides a broad range of printer emulations, including a flawless PCL 4.

The OmniLaser was one of the first PostScript printers available for the PC, and it's showing its age. At press time, TI was readying a 16-ppm version of its 68000-based MicroLaser that will list for about $4000.

The Most Printer for the Money

All the printers in this roundup proved adequate to the task of producing quality PostScript output, but only a handful had the muscle to meet the heavy demands of network printing. The TI OmniLaser 2115 and the Kyocera Q-8010 are both too slow, and even the Apple LaserWriter IINTX falls short in some key performance areas.

If it's a matter of Adobe or die, the QMS-PS 820 Turbo is an excellent machine that's quite fast. Still, it's no match for the Qume CrystalPrint Express or the NewGen TurboPS/480 in either speed or output quality. While the Qume has a slight edge in performance and price, the NewGen combines excellent speed and font handling with the highest resolution you can buy in this price range. For graphical computing in the nineties and beyond, the Best Buy PS/480 has the stuff to make your documents shine.

Ross Smith is a freelance writer and an electronic publishing consultant. His latest book, Learning PostScript: A Visual Approach, *is available from Peachpit Press. Daniel Tynan is an associate editor for* PC World.

WHERE TO BUY

Apple LaserWriter IINTX
Apple Computer, Inc.
20525 Mariani Ave.
Cupertino, CA 95014
408/996-1010
LIST PRICE: with 6MB RAM, letter- and legal-sized paper trays, serial, AppleTalk, and SCSI ports $7087
ACCESSORIES: 200-sheet paper trays $89 each, 15-sheet envelope feeder $89; 1MB RAM $299, 4MB RAM $999; integrated toner/drum/developer unit $129; 20MB SCSI hard disk $699, 40MB SCSI hard disk $1299, 80MB SCSI hard disk $1799
WARRANTY: 12 months parts and labor, carry-in
EXTENDED WARRANTY: through dealer
TECHNICAL SUPPORT: through dealer
OTHER SUPPORT: none
Reader service no. 795

Kyocera Q-8010
Kyocera Electronics, Inc.
100 Randolph Rd.
Somerset, NJ 08873
201/560-0060,
201/560-8380 (fax)
LIST PRICE: with 5MB RAM, letter- and legal-sized paper trays, parallel, serial, and AppleTalk ports $7074
ACCESSORIES: 250-sheet letter-sized paper tray $62.95, legal- or A4-sized paper trays $78.95 each, B5-sized paper tray $131.95; 1000-sheet letter-sized paper feeder $895, legal-sized adapter kit $95; toner cartridge $36.95, drum $179.95, developer $169.95; 1MB RAM $520; Swiss 721, ITC Garamond, ITC Korinna font cards $325 each
WARRANTY: 90 days parts and labor, carry-in
EXTENDED WARRANTY: through dealer
TECHNICAL SUPPORT: toll-free number, M–F 7–6
OTHER SUPPORT: BBS
Reader service no. 796

NewGen TurboPS/480
NewGen Systems Corp.
17580 Newhope St.
Fountain Valley, CA 92708
714/641-8600,
714/641-2800 (fax)
LIST PRICE: with 5MB RAM, letter- and legal-sized paper trays, parallel, serial, and AppleTalk ports $7584
ACCESSORIES: 200-sheet paper trays $89 each, 15-sheet envelope feeder $89; SCSI interface $149; standard high-resolution cartridge $195, high-density toner cartridge $195, integrated toner/drum/developer unit $129
WARRANTY: 12 months parts and labor, carry-in (on-site service optional)
EXTENDED WARRANTY: available
TECHNICAL SUPPORT: toll-free number, M–F 7–6
OTHER SUPPORT: BBS, CompuServe, and AppleLink forums
Reader service no. 797

QMS-PS 820 Turbo
QMS, Inc.
One Magnum Pass
Mobile, AL 36618
800/631-2692,
205/633-9064 (fax)
LIST PRICE: with 4MB RAM, letter- and legal-sized paper trays, parallel, serial, AppleTalk, and SCSI ports $7565
ACCESSORIES: 200-sheet paper trays $75 each, 15-sheet envelope feeder $75; 1000-sheet paper feeder $795; 2MB RAM $995, 4MB RAM $1495; toner/drum/developer unit $130; 20MB SCSI hard disk $999, 40MB SCSI hard disk $1499
WARRANTY: 12 months parts and labor, carry-in
EXTENDED WARRANTY: available
TECHNICAL SUPPORT: toll number, M–F 8–5
OTHER SUPPORT: none
Reader service no. 799

Qume CrystalPrint Express
Qume Corp.
500 Yosemite Dr.
Milpitas, CA 95035
800/223-2479,
408/942-4052 (fax)
LIST PRICE: with 3MB RAM, letter- and legal-sized paper trays, parallel, serial, and AppleTalk ports $5724
ACCESSORIES: 250-sheet legal-sized paper tray $69; toner cartridge $27
WARRANTY: 12 months parts and labor, carry-in
EXTENDED WARRANTY: through dealer
TECHNICAL SUPPORT: toll-free number, M–F 7–5
OTHER SUPPORT: none
Reader service no. 800

Texas Instruments OmniLaser 2115
Texas Instruments Inc.
Information Technology Group
P.O. Box 202230
Austin, TX 78720
800/527-3500
LIST PRICE: with 3MB RAM, letter- and legal-sized paper trays, parallel, serial, AppleTalk, and RS422 ports $8064
ACCESSORIES: 250-sheet paper trays $69 each; toner kit with two cartridges $79, master toner pack with 24 cartridges $948; Lubalin Graph, Souvenir, and Garamond PostScript font cartridges $329 each
WARRANTY: 12 month parts and labor carry-in; 90 days parts and labor on-site, or 36,000 pages, whichever comes first
EXTENDED WARRANTY: on-site or carry-in
TECHNICAL SUPPORT: toll number, M–F 8–5
OTHER SUPPORT: none
Reader service no. 801

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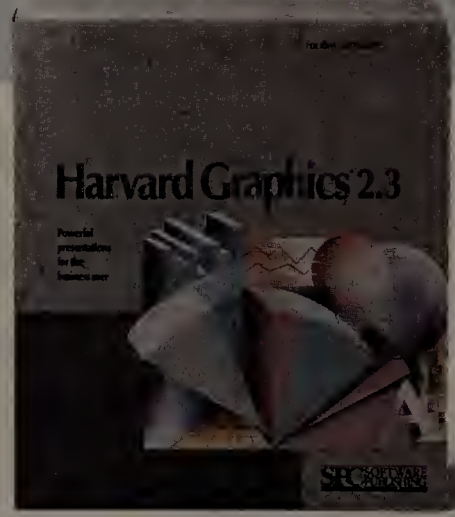

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HARDWARE SPECIAL ISSUE

Seven SX Laptops: Windows for the Road

Now you *can* take it with you. Seven SX laptops offer speed, displays, and hard disks suitable for wandering Windows users.

John Diebold

JOHN GREENLEIGH

Laptops such as our Best Buy, Toshiba's T3100SX, are sufficiently powerful for Microsoft Windows, yet small enough to make suitable flying companions.

With the smallest footprint of the bunch, Compaq's SLT 386s/20 leaves room for a mouse, even on an airline tray. It's fast too, but the $6318 estimated street price is high.

Not so long ago, only a masochist would have wanted to run *Windows* on a laptop. Gazing at a grainy image while waiting for *Excel* to repaint the screen was few users' idea of fun. But today, thanks to better displays, fast 386SX CPUs, and smaller, more efficient hard drives, opening *Windows* on the road is a reasonable option.

What do you need to take *Windows 3.0* for a ride? Most important, you need 4MB or more of CPU-speed RAM, good VGA graphics with 16 easily definable shades of "gray," and enough speed to keep *Windows* moving. Naturally, any laptop (whether running *Windows* or not) should be small and light and run at least 2 hours on its batteries. The hard disk should hold at least 40MB, with larger disks available if and when you need them (see the sidebar "Buying Smart" for more details).

You'll also need a serial port for your mouse or trackball; so far, bus mice are solely a desktop option, although some forthcoming laptops will pack PS/2 mouse ports or other options (see the sidebar "Portable Pointers"). Fortunately, serial ports are no problem: All these laptops have at least one.

PC World took a close look at seven *Windows*-capable 386SX laptops. In order to help you draw useful comparisons between these machines, we configured and priced each of them with a VGA display, an internal modem, a built-in floppy drive, a 40MB hard disk (or the next larger available size), and at least 4MB of RAM. We timed how long these computers would run before their batteries ran out, and we weighed them with all the paraphernalia you need when traveling. Finally, to find out what you'll really pay for these computers, we averaged street prices from more than 80 stores across the country.

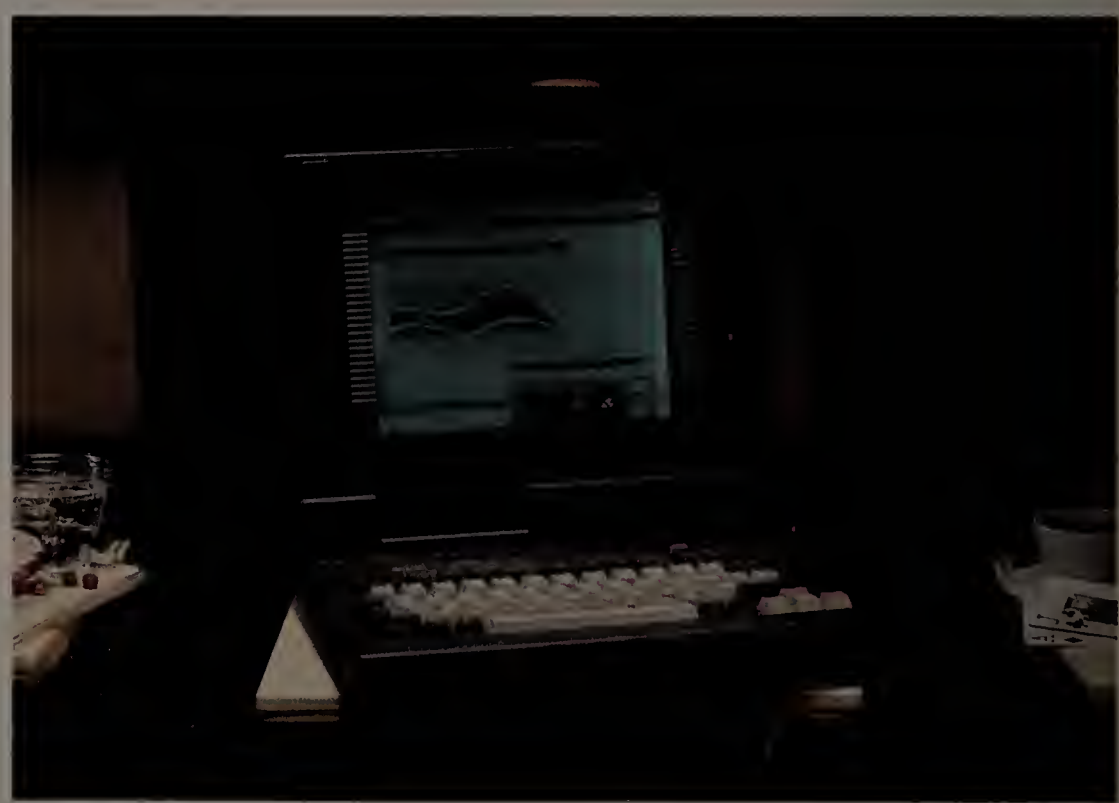
Toshiba's T3100SX won Best Buy honors for its long-lasting twin batteries, crystal-clear gas plasma display, high RAM capacity, and reasonable price. With a laptop like this, you need never leave *Windows* behind.

Compaq SLT 386s/20

PROS: Top speed, compact, long battery life, high memory capacity

CONS: Expensive, limited shades of gray

If you like your laptops small and fast, the diminutive SLT 386s/20—the only 20-MHz SX laptop available at press time—is the one you're looking for. It leads in memory capacity (you can stuff this powerhouse with 14MB of RAM) and is near the top in battery life. In fact, we ran it for nearly 3 hours in "normal mode" (with battery-saving features disabled). But the display has limited capabilities, and the estimated $6318 street price is the second highest in the roundup. (Because the 386s/20



At $4078, Dell's 316LT costs less than the competition, but its bulky size, relatively heavy weight, and short battery life make it a demanding traveling partner.

JOHN GREENLEIGH

BUYING SMART: CHOOSING A WINDOWS MACHINE TO GO

If you simply run into your local Computers-R-Us store, plunk down a wad of cash, and ask for their best SX laptop, you'll probably live to regret it. But if you know what you're looking for and check out each model carefully, you'll get a good computer at a good price.

Memory Capacity Multitasking environments need a lot of RAM. When they don't get it, they swap programs to the hard disk, dragging down performance and battery life. An increase in RAM will reduce disk use, speed up Windows' performance, and provide a net increase in battery life.

Four megabytes of CPU-speed RAM (placed on the motherboard or in a high-speed slot) is probably adequate for most Windows users today, but if you plan on keeping your laptop for at least five years you'll want the option to expand it to 8MB or more.

Screen The G in GUI stands for *graphic*. Because Windows and its applications use complex screens, making full use of shape and color to convey information, they place severe demands on laptop displays. Look for a screen with VGA resolution, 16 discernible shades of gray within Windows, and an aspect ratio (width to height) that renders circles round and boxes square.

LCD displays can't turn pixels on and off quickly. As a result, text and graphics tend to fade slowly in and out. This can be really annoying when you move your mouse quickly and the on-screen arrow disappears. If you're buying an LCD laptop for Windows, try to arrange a presale mouse demonstration. Or you can avoid the whole issue and go for the clearer, sharper image and quicker rewrite of a gas plasma display.

Performance Because they point the screen pixel by pixel, GUIs run slower than text-based programs. Multitasking environments, in which the CPU handles several programs at once, are also slow. Hence, a multitasking GUI like Windows will crawl on a slow computer. The moral: Fast is good; fastest is best.

Portability Portability simply means weight and size. Even with a battery, an AC adapter/charger, power cables, and a carrying case, you shouldn't have to lug around more than 20 pounds. If your laptop is much larger than 500 cubic inches, it will be a hassle finding room for it on an airline table or under the seat.

Battery Life To keep you working longer, most laptops let you lower the backlighting, and they offer a power conservation mode that temporarily turns off power-consuming devices like hard disks and modems. But some components restart slowly, and no one likes a dim screen, so consider how long a laptop runs without such power-saving strategies. Two hours of battery life is the bare minimum you should accept.

When it's time to recharge, an indicator showing that battery charging is actually taking place is essential. Even better is a signal when charging is complete. Also worthwhile: the ability to change batteries without shutting down your laptop.

Keyboard The need for compactness always forces some compromises, but the closer a keyboard gets to the standard layout, the better. A separate numeric keypad is too much to expect, but you should demand 12 dedicated function keys, a set of cursor keys in the standard inverted T, and page control keys in more or less the usual locations.

Expandability Considering the enormous storage requirements of Windows and its applications, the bigger your hard disk, the better. Even if you can't afford a big disk now, you don't want to be limited in the future. Look for laptops with an 80MB or 100MB hard disk upgrade option.

Laptops don't offer much in the way of on-board slots, but some manufacturers have found room to squeeze one in. If you decide to add an ethernet or fax card somewhere down the line, you'll appreciate a slot to slide it into. An industry-standard slot will give you more choices than a proprietary slot.

Design and Construction A well-built laptop should be rugged without being too heavy. Look for lids and covers that don't fall off, a carrying handle that feels secure (and folds or slides out of the way when not in use), and a hinge sturdy enough that the display stays where it's put when opened.

Service and Support One-year warranties are standard, and you should accept nothing less. Telephone technical support—preferably toll-free—is a must. If support is offered only through dealers, make sure you can get it at any authorized store, not just the one where you bought your laptop, as service away from home is especially important.

To check the quality of support offered, we made a series of calls to the technical hot lines of manufacturers that offer direct support. We got prompt and courteous support from all of them. Such consistency cannot be guaranteed, however, when support is available through dealers. —*J. D.*

FEATURES EVALUATION

Toshiba Presses All the Right Buttons

Deeply discounted at many stores, Toshiba's T3100SX offers a large memory capacity, a gas plasma display, and excellent battery handling at a reasonable street price. Compaq's SLT 386s/20 is faster and more portable, but its street price is high and its screen has 8 instead of the usual 16 gray shades.

● Yes
○ No
◒ Deficient

	Compaq SLT 386s/20	Dell 316LT	Epson Equity LT-386SX	Grid 1450SX	NEC ProSpeed 386SX	Toshiba T3100SX	Zenith SupersPort SX
Standard features							
Street price[1]	$6318[2]	$4078	$4621	$8345[3]	$5169	$5264	$5039[3]
List price[1]	$9026[2]	$4078	$6795	$8345[3]	$9026	$9446[3]	$7555[3]
CPU speed (MHz)	20	16	8/16	16	16	16	8/16
CPU-speed RAM capacity	14MB	8MB	4MB	5MB	9MB	13MB	8MB
Screen							
Type	LCD	LCD	LCD	LCD	LCD	plasma	LCD
Size (inches)	7¾ x 5⅞	7¾ x 5¾	8¼ x 6¼	7¾ x 5	7½ x 5⅝	7¾ x 5¾	8 x 6
Portability							
Traveling weight (pounds)[4]	18.6	20.4	22.7	13.3	22.1	18.9	18.6
Volume (cubic inches)	459	591	613	489	634	556	585
Battery life							
With power-saving features enabled (hours:minutes)	3:50	2:00	2:50	2:20	2:30	3:20	4:00
With power-saving features disabled (hours:minutes)	2:55	1:40	2:20	2:05	1:50	3:05	3:05
In-use battery change	○	●	○	○	○		○
Charger indicates charge in progress	●	○	●	●	●		○
Keyboard							
Dedicated cursor keys in inverted T	●	●	●	●	●		●
Dedicated page control keys	○	●	●	●	●		○
12 dedicated function keys	●	●	●	◒[5]	●		◒[5]
Expandability							
Standard 8/16-bit slots	0	0	1[6]	0	0	0	0
Standard 8-bit slots	0	1 short	0	0	0	0	0
Proprietary slots[7]	0	0	0	0	1	1	0
Largest hard drive available	120MB	40MB	40MB	40MB	100MB	80MB	120MB
Service and support							
Warranty period (months)	12	12	12	12	12	12	12
Free on-site service	◒[8]	●	○	○	○	●	○
Central toll-free support number	○	●	○	●	○		○
Daily support (hours)	◒[8]	7–7	7–5	6–5	8:30–5:30	7–5	◒[8]
Weekend support	◒[8]	○	○	○	○	●	◒[8]
Central BBS	○	●	●	○	●		●
Central tech support fax number	○	●	○	●	○	●	○
						BEST BUY	

[1] Price based on 4MB RAM, 40MB hard drive, DOS 3.3 or later version, 2400-bps internal modem, carrying case (except as noted).
[2] With 60MB hard disk.
[3] With 5MB of RAM.
[4] Including battery, carrying case, modem, AC adapter, and cables.
[5] <F11> and <F12> not dedicated.
[6] ⅔ length.
[7] Dedicated RAM or modem slots not included.
[8] Via dealer; may vary locally.

was not yet in stores at press time, we estimated the street price from discounts on other Compaqs.)

The SLT's 18.6-pound weight is lighter than most, but it's the compact size that makes this machine exceptionally portable. The 386s/20 is right at home on an airline tray table—you may even have enough room left for a mouse. But even though the display is pretty, this is the only laptop in the roundup that limits you to eight shades of gray.

There are no internal slots, but you can buy the SLT with a 120MB hard disk; no one offers a larger one, and the optional $999 expansion chassis holds two standard 8/16-bit cards. You can detach the SLT's keyboard from the main unit to find a more comfortable place for it, but it has no dedicated page control keys, and the touch is soft.

Compaq handles service and support via dealers, but your warranty will be honored by Compaq dealers worldwide. Although the quality of service may change with location, Compaq dealers generally offer good support.

It all boils down to this: If you can stomach the high cost, you'll find the SLT 386s/20 more than satisfying, screen shortcomings notwithstanding. With dazzling performance, first-rate RAM capacity, and great portability, this Compaq may be all the computer you need, even at the office.

Dell 316LT

PROS: Very inexpensive, in-use battery change, fast

CONS: Heavy, bulky, short battery life

You can buy a 316LT—in the *PC World* configuration—direct from Dell for $4078, the lowest street price of any laptop here. It did very well in our benchmarks, and its display and 8MB RAM ceiling are perfectly acceptable. The fine keyboard has dedicated page control keys and an excellent touch. But the machine's 20 pounds and 591 cubic inches make it a burden to carry.

The 316LT's battery is a good news/bad news situation. The good news is the light (1.7-pound) battery pack, which you can replace while an internal backup keeps the laptop going. The bad news is that battery life is short—we were able to keep the 316LT going for only an hour and 40 minutes—and there's no way to tell that the AC adapter is actually doing anything.

Dell's customer service policies are the best in the business. You get free on-site service for the life of the warranty; a BBS; free, automated phone-for-a-fax service; and a toll-free support number that's staffed 12 hours a day.

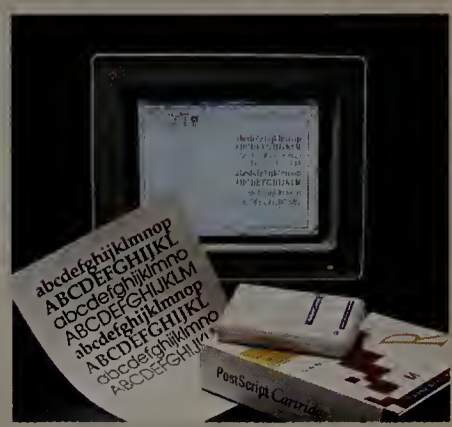
While the 316LT is something of a heavyweight, its low price, solid keyboard, clear display, and respectable 8MB RAM capacity make it a very good (though not-so-portable) vehicle for GUIs on the go.

UPGRADES FOR THE '90S #4

True-Blue PostScript on the Cheap

If you love your LaserJet Series II but hunger for fonts-fonts-fonts, don't despair. With Adobe's new PostScript Cartridge, you get real (not just compatible) PostScript power for your printer. Plug this cartridge into your Series II's left slot, and you suddenly have a LaserWriter IINT at your command, complete with 11 scalable Adobe typefaces and four variants thereof; the ability to skew, rotate, and otherwise manipulate type and graphics; and surprisingly fast output—all for $495. However, unlike JetWare's cartridge, Adobe's offering won't work in the Series IIP, IID, or III.

You even get matching screen fonts for *Ventura Publisher* and *Microsoft Windows* plus LaserTool's *Printer Control Panel*, which boosts output speed and automatically switches the LaserJet between PostScript and HP modes. Physically installing the cartridge is a snap, but installing the necessary utilities and generating screen fonts for *Windows* and *Ventura* is a convoluted process.



Adobe's cartridge isn't easy to install, but the output is fast and sharp, and the price is right.

Luckily, configuring your program for PostScript printer output is pretty straightforward. With *Windows* and most DOS programs, you simply use a PostScript printer driver. Once you're set up, printing is transparent and surprisingly fast. Getting there isn't much fun, but the end result is a dream. List price: $495, additional font cartridges $395. Adobe Systems Inc., 1585 Charleston Rd., P.O. Box 7900, Mountain View, CA 94039-7900; 800/344-8335.
—*Robert Luhn*

Reader service no. 725

TONY CARLSON

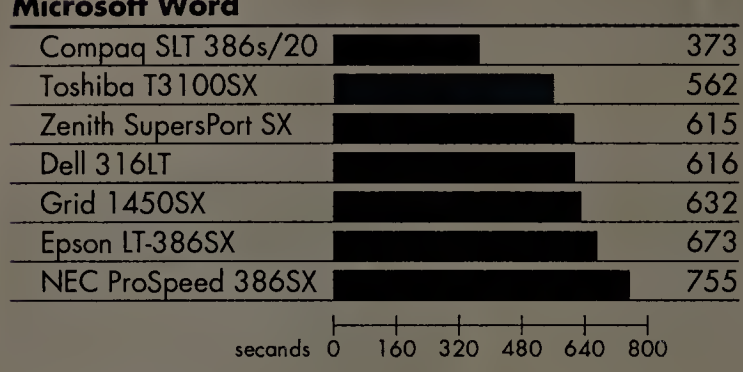
PC WORLD TEST REPORT

Compaq Comes In a Lap Ahead

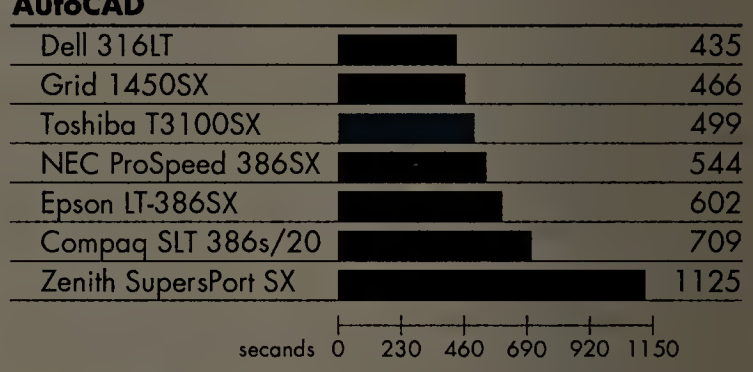
As you'd expect, the 20-MHz Compaq SLT 386s/20 beats all the 16-MHz laptops hands down. Among the 16-MHz machines, none establishes a clear performance advantage, although the Grid 1450SX and the Dell 386LT come out ahead when test results are combined.

Best Buy

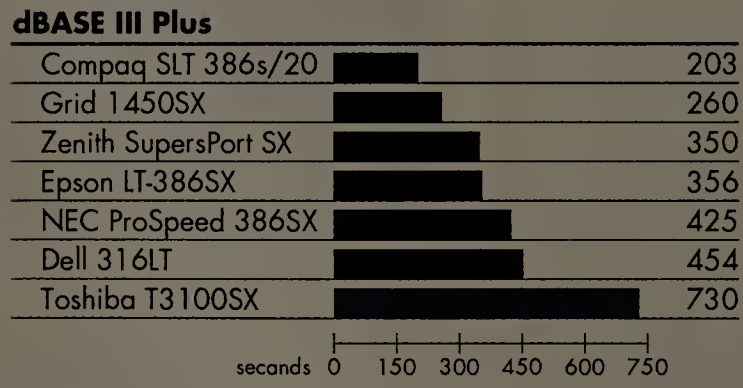
Microsoft Word



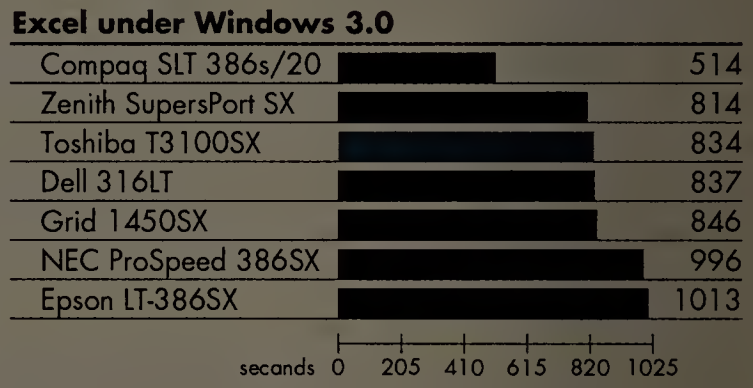
AutoCAD



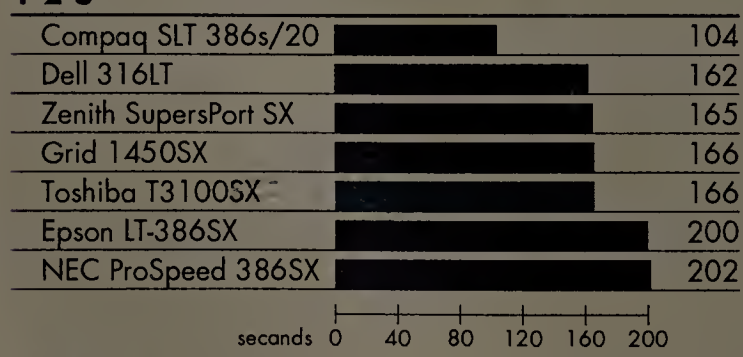
dBASE III Plus



Excel under Windows 3.0



1-2-3



Methodology
All the computer systems were tested with a 256K extended-memory disk cache except in the *Excel* under *Windows 3.0* and the *1-2-3* tests. Systems were tested with the following amounts of RAM: Compaq SLT 386s/20, Dell 316LT, Epson LT-386SX, and NEC ProSpeed 386SX, 4MB; Grid 1450SX, Toshiba T3100SX, Zenith SupersPort SX, 5MB. Every computer was tested with the vendor's version of DOS, and each system had a 40MB hard disk except the Compaq SLT 386s/20, which had a 60MB hard disk.

Microsoft Word 5.0
Microsoft Word loads and quits the program, loads a document 50 and then 100 times, block copies the entire document 100 times, performs multiple search-and-replace operations, and repaginates and checks the spelling of a 90-page document. The document is scrolled in both graphics and text mode, saved 25 times, and printed to an output file. Although the results of the benchmark depend primarily on processor and memory access speeds, display adapter and hard disk speeds are also contributing factors.

dBASE III Plus 1.1
The *dBASE III Plus* test measures the time required to process a batch of 250 transactions. Each transaction consists of updating a record in the Accounts, Teller, and Branch files and in an indexed History file. In this benchmark, which uses a disk cache, sequential read performance becomes more important than random access.

1-2-3 2.01
In this benchmark, a *1-2-3* macro executes a series of recalculations using five different formulas within a 75-by-75-cell matrix. Because there are few screen updates and no disk access is required, the results depend almost entirely on processor and memory access speeds.

AutoCAD 10
In this benchmark, a three-dimensional sample drawing is retrieved and displayed from multiple perspectives. A 3-D array is created using an AutoLISP routine, new elements are introduced, and a drawing is generated with filling on and off. The results of the test depend primarily on the speeds at which the processor and coprocessor operate and at which memory is accessed. The performance of the display adapter and of the hard disk also have some effect.

Excel under Windows 3.0
In this benchmark, *Excel 2.1c* running under *Windows 3.0* executes these operations: transcendental calculations; cuts and pastes; charting; inserts and deletes; financial calculations; array functions; data base functions on a 100K, 500K, and 1500K data base; file operations; defined functions; and a large recalculation. The results for this benchmark depend primarily on processor and memory access speeds.

Data based on tests designed and conducted by National Software Testing Laboratories (NSTL), Conshohocken, PA 19428. All rights reserved.

Epson Equity LT-386SX

PROS: Removable hard drive, low price

CONS: Heavy, bulky, low memory capacity

At 23 pounds, this $4621 machine (estimated street price) is the heaviest laptop reviewed. Moreover, its CPU-speed RAM tops out at a cramped 4MB. Display, battery life, and performance are acceptable but not outstanding. On the bright side, it has a removable hard drive (see *Product Outlook*, September 1990) and a standard 8/16-bit short slot.

The removable drive (20MB and 40MB versions are available) will come in handy if you need to lock your data in a safe or exchange large files with other LT-386SX users. The keyboard has a clacky feel, and while there *are* dedicated page control keys, and cursor keys in an inverted T, their nonstandard placement in the upper right corner will slow you down. As with the Compaq, support is handled directly through dealers, so the quality may vary.

Unless you must keep your hard disk and laptop separate, the Epson's only exciting feature is its low price. And you may be able to get the Dell for less.

Grid 1450SX

PROS: Small, fast, lightest in roundup

CONS: Expensive, low RAM capacity

You can easily take this small, fast, extremely light, well-built laptop anywhere business sends you, but you'll pay a high price for the privilege. At $8345 (direct from Grid, in the *PC World* configuration), this is by far the most expensive laptop we looked at.

When it comes to portability, nothing beats the 1450SX's 13.3-pound weight and small size. This Grid's fast too, coming in first or close to first among the 16-MHz machines in most of our speed tests. The screen is clear and readable but not outstanding, and the 2 hours plus of battery life is adequate. The big disappointment—aside from the high price—is the RAM capacity; you'll never get more than 5MB into this PC.

Grid occasionally offers discounts of 15 or 20 percent, so you may be able to get the pricey 1450SX for less than list. If portability is your main criterion in an SX laptop, the Grid is well worth considering. But if you want a machine for running *Windows*, look for one with a higher RAM ceiling.

NEC ProSpeed 386SX

PROS: 100MB hard disk option

CONS: Heavy, slow, low RAM capacity

The 22-pound ProSpeed 386SX falls down in several important areas. If you want to install more than 4MB of CPU-speed RAM, you'll need to use its one and only (proprietary) expansion slot—and even then you can get up to only

UPGRADES FOR THE '90S #5

The Palm-Sized Hard Disk

Plus Development's Hardcard proved that a hard disk doesn't have to be big and noisy. Disktec has taken this less-is-more approach to its logical extreme and produced the Disctec RHD 20, a minuscule, removable, 23ms 20MB hard disk that weighs only 7 ounces and needs only 1 watt but can take an amazing 100 g's of nonoperating shock. It's the perfect storage fix for anyone who has a laptop computer (such as a Toshiba 1100+ or Compaq LTE/286) or needs a hard disk that can be moved easily from machine to machine.

Although the Disctec is a deal compared to heftier totable drives like the Passport or Personal Data Pac, it's not much fun to install. You have to change jumpers, use FDISK, wrangle with the Disctec's confusing installation program, and dig through a manual larded with technical minutiae and conflicting instructions. A PC veteran can probably install and format the beast in about an hour.

The Disctec is tough and small, and you can plug it into any laptop or PC via a cheap docking bracket.

Once tamed, the Disctec purrs like a kitten and travels like a champ. Just pluck the drive out of your PC, drop it into your briefcase, take your cross-country flight, and slide it into PC at the other end that's equipped with a Disctec docking bracket. This is as portable as computing gets. List price: $595, docking bracket $65 to $100. Disk Technologies Corp., P.O. Box 1750, Winter Park, FL 32790; 800/553-0337, 407/628-4404 (fax). —*Robert Luhn*

Reader service no. 731

TONY CARLSON

EXECUTIVE SUMMARY

Power, RAM, and Good Looks: Toshiba T3100SX

A great keyboard, room for plenty of RAM, and a fast, bright display turn out to be a winning combination.

All these laptops offer VGA displays, 40MB or larger hard disks, and at least 4MB of RAM capacity, making them reasonable choices for Windows users on the go. But not all flat-screen VGA displays are equal, and some laptops offer exceptional storage and RAM expansion. Portability, battery life, and performance also vary significantly.

BEST BUY

The Best Buy **Toshiba T3100SX** scores on every level. It's got a great gas plasma display, dual batteries, solid expansion capacity, an excellent keyboard, and consistently high performance, all for a reasonable $5264 (estimated) price. If the T3100SX is meat and potatoes, Compaq's **SLT 386s/20** is caviar and champagne. Its 20-MHz performance is beyond compare, and it's highly portable, but its screen is disappointing and its $6318 (estimated) price is high.

	Compaq SLT 386s/20	Dell 316LT	Epson Equity LT-386SX	Grid 1450SX	NEC ProSpeed 386SX	Toshiba T3100SX	Zenith SuperSport SX
Memory capacity	Excellent	Good	Fair	Fair	Good	Excellent	Good
Screen	Fair	Good	Good	Good	Fair	Excellent	Good
Performance	Excellent	Excellent	Fair	Excellent	Poor	Good	Good
Portability	Excellent	Fair	Poor	Excellent	Poor	Good	Good
Battery	Excellent	Fair	Good	Good	Fair	Excellent	Excellent
Keyboard	Fair	Excellent	Fair	Good	Good	Excellent	Fair
Expandability	Good	Good	Excellent	Poor	Excellent	Excellent	Good
Design and construction	Excellent	Fair	Fair	Excellent	Good	Excellent	Good
Service and support	Fair	Excellent	Poor	Good	Good	Excellent	Fair
Price	Fair	Excellent	Good	Poor	Good	Good	Good
Overall value	Good	Good	Fair	Good	Fair	Excellent	Good
						BEST BUY	
Reader service no.	775	776	777	778	779	780	781

How we rate 386SX laptops
We rate these machines based on information in the Features Evaluation and PC World Test Report; our reseorcher's doto on street prices and the convenience of support; ond the authar's opinian af quality, reliobility, ond user benefit.

Memory capacity reflects what's required to multitosk, naw ond in the future. Yau shouldn't even consider a laptap that can't hald 4MB. With 8MB, disk swopping can be nearly eliminoted. A copocity of 10MB ar mare ensures ample multitasking roam far the foreseeable future and earns an Excellent roting.

Screen measures disploy quolity in terms of resolution ond clarity. Canveniently placed brightness and cantrast cantrals are importont, too. An Excellent rating is awarded for displays with 16 easily distinguishoble shades af gray (in *Windows*) ond a *Windaws* cursar that remains visible when yau move the mause. All these laptaps have good-sized ond well-shaped screens.

Performance assesses how fast these computers run. The 16-MHz machines were campared only with each other, while the ane 20-MHz camputer wos compored with the best 16 MHz's. Because af the GUI noture of this roundup, the *Windaws Excel* test wos given extra weight.

Portability evaluates haw easy these loptaps ore ta carry around. To earn an Excellent rating, o computer must weigh 15 pounds or less ond/ar take up less than 500 cubic inches of spoce.

Battery rotes how lang yau can keep the camputer running oway fram an AC outlet, as well os how easy it is ta change and recharge batteries. Far an Excellent roting, a laptap must deliver aver two ond o half haurs af battery life withaut using its battery-canservotian feotures. Other factars include in-use bottery chonging ond a charging indicator.

Keyboard ratings reflect the effort required for o user ta switch fram o standard desktop keybaard ta a still-nat-standard laptop. An Excellent roting requires cursar keys in an inverted T, dedicated poge cantral keys, samething clase ta a stondord layaut, and (in this reviewer's subjective apinian) o firm, responsive feel.

Expandability is ane area in which laptaps can't compete with desktop machines, but the presence of o single an-board slat and an aptian far either a 100MB ar a remavable hard disk ore still required for on Excellent rating. Extra paints are given far a slot thot occepts industry-standard boards.

Design and construction ore af utmost impartance when you're shaving a $5000 computer under the airline seat in front of you. Since o team af garillas wasn't availoble, we've relied on the reviewer's impressions ond some estimotian of the past performance af the monufocturers.

Service and support are essential when you're an the raad, cut aff fram the office gurus and easy access ta backup computers. An Excellent rating requires o tall-free technicol support number ond BBS ar fax support.

Pricing scores street (not list) price and is based an aur phane survey af deolers in seven mojar camputer markets across the country.

Overall value combines the above criteria, with extro weight given to CPU-speed RAM capacity, screen, performonce, and price.

Small and very light, Grid's 1450SX still leaves little room on an airline tray to roll a mouse. Furthermore, the $8345 price tag is very high.

9MB. The display is somewhat streaky, with lines occasionally emanating from objects on screen. Furthermore, it's big, heavy, and slow.

On the other hand, if you can live with 4MB, there's a good selection of boards for that single slot—everything from ethernet and SCSI to the interface for NEC's 4-slot expansion chassis. If you don't mind spending an extra $800, you can buy the ProSpeed with a 100MB hard drive, the second largest disk option in the roundup. But its battery pack ran for only 110 minutes.

The midpriced ProSpeed is available for around $5100 in the *PC World* configuration. But you can get a better machine—like the Dell—for less money, and a *much* better one—the Toshiba T3100SX—for about the same price. You're better off passing this one by.

Toshiba T3100SX

BEST BUY

PROS: Excellent battery life, sharp gas plasma display, fine RAM capacity

CONS: None

If you're planning to travel with *Windows,* Toshiba's $5264 T3100SX—with a great keyboard, first-rate battery life, spectacularly sharp gas plasma screen, and 13MB memory ceiling—is the laptop for you. Even in its least impressive areas, such as size, weight (18.9 pounds), and performance, it comes in no worse than average.

Despite the power-hungry gas plasma screen, the T3100SX's battery life proved excellent, with its twin batteries lasting just over 3 hours. Furthermore, thanks to those twin batteries and their accessible bays, you won't have to power

PORTABLE POINTERS

If you're going GUI, you need a pointing device. And if you think it's hard finding room for a mouse in the clutter on your desk, try rolling one on an airline tray table that's barely big enough for your laptop!

A trackball uses less room than a rodent and seems a reasonable alternative—but you're still not likely to fit one on the leftover corner of an airline tray. You could, of course, put the trackball in your lap, if you don't mind attracting stares from your fellow passengers.

The best solution is a pointing device built into the laptop. Craig Culver's Isopoint is an elegantly intuitive gadget that's making its first commercial appearance in Grid's GridCase 1550SX. (The GridCase shipped too late for inclusion in this roundup, but a report appears in *Product Outlook*.)

The Isopoint is a small cylinder about the size of a soda straw, placed beneath (and parallel to) the space bar. Sliding the cylinder from side to side with your thumb moves the cursor left and right; rolling it controls vertical position. Culver's invention is compact, integral to the keyboard, and can be used without moving your fingers from the keyboard.

Unfortunately, the Isopoint is just beginning to slide and roll its way into the world. You may have to wait awhile before you evict that mouse from your pocket. —*J. D.*

The Isopoint lets you "mouse around" without leaving the keyboard.

JOHN GREENLEIGH

down to change a battery.

The T3100SX includes one built-in proprietary slot, but the only available board so far is an ethernet adapter. The optional $999 expansion chassis can handle five standard 8-bit cards. The keyboard is the best in the roundup, with a close-to-standard layout and a firm but responsive feel.

This is a fine laptop system: Its 13MB RAM capacity, beautiful gas plasma display, long-lasting, easy-to-change batteries, great keyboard, and reasonable street price combine to earn it a Best Buy citation.

Zenith SupersPort SX

PROS: Outstanding battery life, 120MB hard disk option

CONS: Mediocre keyboard

With the exception of its long-lasting battery and large hard disk option, the only word for the Zenith Data Systems (ZDS) SupersPort laptop is "average." Its weight (18.6 pounds), size, display, and RAM capacity (8MB) are all respectable, and it comes in a bit above the norm on our speed tests. All of this is available at a low—but not exceptionally low—street price of $5039. Only the keyboard falls below par.

The battery is a dumbbell-shaped lump that snaps easily into place. At nearly 5 pounds, it feels like a dumbbell, too. But there's a lot of juice in those 5 pounds; we were able to keep the Zenith going for just over 3 hours unplugged. If you like, you can slide three standard 8-bit cards into the SupersPort's $599 optional desktop expansion chassis. Again, support is handled only through dealers, and while ZDS trains dealers in this area, the quality may vary.

ZDS's version of DOS 3.*x* conflicts with Microsoft's *Windows 3.0*, so ZDS offers its own licensed edition of *Windows*. If you're running ZDS's DOS 4.1, you can use Microsoft's *Windows* with no trouble, but it's worth getting ZDS's version anyway, as it gives you easier access to all 16 shades of gray.

In this company, "average" isn't bad; the SupersPort SX is a good *Windows* platform. But you can get a much better screen and higher RAM capacity with the Toshiba T3100SX—without paying a lot more for it.

Top of the Laptops

The clear winner here is the midpriced Toshiba T3100SX, whose long-lasting, easy-to-change batteries, clear gas plasma screen, and 13MB RAM capacity earn it a Best Buy rating. In a two-way tie for second place are the fast, powerful (but expensive) Compaq SLT 386s/20 and the very low priced (but heavy and short-battery-lived) Dell 316LT.

No monochrome laptop can offer the colorful graphics, full keyboard, and expansion options of a desktop machine, but the gap is narrowing. As this round-

UPGRADES FOR THE '90S

The 3MB Floppy

Tired of using a mess of floppies to back up your hard disk? Interested in a floppy drive that's two to four times as capacious and fast as your existing floppy? If the answer to either of the above is yes, consider the Practidisk ED, one of the first 3½-inch, 2.8MB floppy drives for the PC, XT, AT, and compatible systems. The drive is surprisingly easy to install and can read, write, and format 720K and 1.44MB 3½-inch disks. You can't boot your PC from it, but if extra storage is a must and you balk at buying a Bernoulli Box or another hard disk, this is one solution.

The Practidisk ED easily wins the No Sweat Award. Plug the floppy disk controller into a free slot, connect it to one of the PC's power supply cables, and connect the controller to the slim external drive. Run an automatic setup program, and you're ready to roll.

The drive is compatible with just about any program (including disk optimizers) or DOS command (you do have to use a supplied utility to format floppies, though). Better yet, it's compatible with other 2.8MB offerings—including the high-capacity floppy drives that IBM's rumored new line of desktop computers will reportedly use. Now *that's* planning for the future. List price: external drive and kit $598, internal drive and kit $478, 2.8MB floppy $9 each. Practical Computer Technologies, 3972 Walnut St., Fairfax, VA 22030; 703/385-3332, 703/385-0326 (fax). —*Robert Luhn*

Reader service no. 726

This plug-and-play drive uses 720K and 1.44MB disks, stores 2.8MB for $9, and may be the standard by 1992.

TONY CARLSON

Five lessons other companies have yet to learn about PostScript® printing.

1 *Genuine Adobe® PostScript.® You need a true Adobe PostScript printer. The Silentwriter2 290 printer from NEC. Some companies emulate PostScript with clone interpreters or add-on cartridges. Others have limited font capabilities. But that's not the way to produce eye-popping newsletters, or 3D charts. We've known this since we introduced our first Silentwriter LC 890 printer back in 1987.*

2 *MS-DOS® and Macintosh® Connectivity. That's right, the 290 works with both Macintosh and PC-compatibles. And with its standard Centronics parallel, RS-232C, RS-422 and AppleTalk™ interfaces, the 290 is ideal for stand-alone or network environments.*

3 *WYSIWYG Screen Fonts. As in What-You-See-Is-What-You-Get. Our printer support kit included with every 290 we sell includes software that lets you see all of the printer's 35 scalable typefaces before you print them out. Also included are diskettes that allow you to install the fonts on any Macintosh or under Microsoft® Windows™ in the MS-DOS environment.*

4 *Memory. With a full 2 MB of standard memory, there's simply no more worry. Since now you have more than enough memory to print a full page of text and graphics (letter or legal size) without losing valuable data. Plus the optional user-installable 2 MB of additional memory satisfies your need to store downloadable fonts and overlays.*

5 *Software. The Silentwriter2 290 is the printer of choice for MS-DOS or Macintosh users working with hundreds of the most popular software packages. With an installed base of over 100,000 Silentwriters, our experience with printer software is hard to beat. Meaning you get more than just a printer, you get answers.*

Since NEC began making PostScript® printers, we've learned how to stay ahead of the competition. Sure, other PostScript printers can do some of these things, but only NEC puts them all together in the Silentwriter® 2 290, the printer that goes to the head of the class. To find out more about the Silentwriter2 290, call us at 1-800-NEC-INFO. In Canada, 1-800-343-4418.

C&C Computers and Communications

NEC

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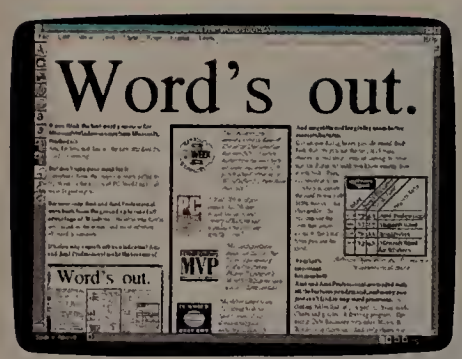
Word's out.

See us at COMDEX/Fall '90 Booth 208

If you think the best word processor for Microsoft Windows comes from Microsoft, think again.
Amí Professional has set the new standard for word processing.

But don't take our word for it.
Everybody from the corporate users polled by PC Week to the editors of PC World and Software Digest says so.



They may look like desktop publishers, but Amí and Amí Professional are what word processing should have been all along. Amí is yours for just $199, Amí Professional for $495.

Because only Amí and Amí Professional were built from the ground up to take full advantage of Windows. Which is why they're recognized as the easiest and most intuitive of all word processors.

It's also why experts acknowledge that Amí and Amí Professional make the best use of Windows' WYSIWYG environment. Instead of relying on archaic "page previews" like Word for Windows, Amí lets you create, see, and edit all elements of your document — text, graphics, even footnotes, headers and footers — in a variety of fully editable views.

Graphics are easier to handle, too. Because Amí "frames" (which can also contain text for page-within-page formats) are true "pick up and place" objects that can be quickly and accurately positioned and sized on screen.

CORPORATE TOP RATED PCWEEK 1990 SATISFACTION POLL

*PC Week Poll of Corporate Satisfaction**

- Amí Professional received a score in Ease of Use of the User Interface that was fully 10 points higher than the next highest score, and came in 14 points ahead of the score WordPerfect 5.1 drew from its buyers.

PC MAGAZINE EDITORS' CHOICE July 1990 Ami Professional Version 1.18

PC Magazine Editor's Choice

- Of all GUI word processors, Amí Professional has the widest variety of features and is perhaps the most enjoyable to use.

PC Computing MVP MOST VALUABLE PRODUCT

PC Computing MVP

- A stunning achievement, one that no other PC word processing product— not even Microsoft's estimable Word for Windows — can claim to have reached.

PC WORLD BEST BUY May, 1990

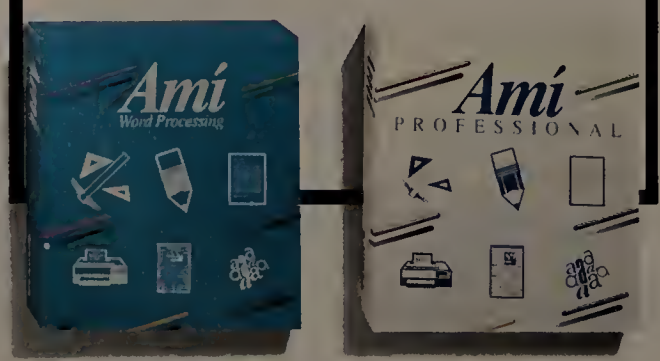
PC World Best Buy

- Amí Pro's easy to use formatting tools are hard to resist. If your documents typically include graphics, it's your Best Buy.

INFO WORLD EXCELLENT VALUE Jan. 29, 1990

Infoworld Excellent Value

- Easily handles graphics mixed with text, imports a host of text and graphics formats effortlessly, and does other office chores such as mail merge with ease and power.



And we get the nod for giving users better access to features. Our unique dialog boxes provide visual feedback that lets you see the results of your choices immediately, without having to reformat the document until you know exactly how it will look. Plus, our shortcut icons — which eliminate the need to use pull down menus — are changeable. So you can use the ones that correspond to the functions you use the most.

Software Digest Ratings Report: Rating	Overall Evaluation	Overall Power	Program Name
★★★	7.9	6.9	Amí Professional
★★★	7.7	7.7	Microsoft Word
★★★	7.6	8.1	Word Perfect
★★★	7.2	6.7	Microsoft Word for Windows

Software Digest rates Amí Professional as the best word processor for Windows and the best word processor overall.

And that's important because both Amí and Amí Professional are loaded with all the features you demand, and many you just can't find in any word processor. Including tables that let you perform basic math. Charts and graphs. A drawing program. Dynamic Data Exchange with other Microsoft Windows applications. And style sheets that make it easy to create sophisticated-looking documents — like this ad!

So whether you're an executive type who types only occasionally, or a heavy user who needs lots of specialized features, one of these programs is definitely your type. Even the experts agree.

When it comes to word processing, Amí is the first and last word.

Call 1-800-831-9679 to order your full feature demonstration version for just $9.95.

SAMNA WORD PROCESSING

MICROSOFT WINDOWS Version 3.0 Compatible Product

Requires IBM AT, PS/2 or compatible (80286 or better CPU); CGA, EGA, VGA or Hercules compatible displays; MS-DOS 3.0 or higher. A free runtime version of Microsoft Windows 2.11 is available to all purchasers of Amí and Amí Professional.

The Demonstration Version of Amí Professional is a fully functional version of the product, except for the thesaurus, some import/export filters, and the ability to save files. The demonstration version requires Windows 2.11 or Windows 3.0.

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HP NewWave Aware

Circle 338 on reader service card

up clearly shows, traveling with windows can mean more than just looking at clouds.

John Diebold is a marine geophysicist specializing in graphics-based analysis of seismic data.

For more information about all products in this article, circle reader service no. 903.

WHERE TO BUY

Compaq SLT 386s/20
Compaq Computer Corp.
P.O. Box 692000
Houston, TX
77269-2000
800/231-0900
LIST PRICE: Model 60 with 2MB RAM, 3½-inch 1.44MB floppy drive, 60MB hard disk, one serial and one parallel port, battery pack and AC adapter/charger $6799; Model 120 same as Model 60 but with 120MB hard disk $7499
ACCESSORIES: 1MB RAM $699, 2MB RAM $1299, 4MB RAM $2599; 20-MHz 80387SX coprocessor $999; 2400-bps internal modem $599; expansion chassis $999; external storage module $299; 5¼-inch 1.2MB floppy drive for external storage module $275; 3½-inch 1.44MB floppy drive $275; 60MB tape drive $799; carrying case $89; DOS 3.31 $120, OS/2 1.21 $340
WARRANTY: 12 months, carry-in
EXTENDED WARRANTY: none
TECHNICAL SUPPORT: through dealer
OTHER SUPPORT: none
Reader service no. 775

Dell 316LT
Dell Computer Corp.
9505 Arboretum Blvd.
Austin, TX
78759-7299
800/426-5150,
512/338-8700 (fax)
LIST PRICE: with 1MB RAM, 3½-inch 1.44MB floppy drive, 20MB hard disk, one parallel and one serial port, two batteries and charger $2999; same as base model but with 2MB RAM $3099, with 4MB RAM $3299, with 8MB RAM $3699; same as base model but with 40MB hard disk $3199
ACCESSORIES: 16-MHz 80387SX coprocessor (factory installed) $399; 2400/9600-bps data/fax modem (factory installed) $399; spare battery $79.95; nylon case $79.95, leather case $199; DOS 3.3 $99.95, DOS 4.01 $119, OS/2 1.1 $299
WARRANTY: 12 months parts and labor, on-site
EXTENDED WARRANTY: up to 48 months, on-site
TECHNICAL SUPPORT: toll-free number, M–F 7–7
OTHER SUPPORT: in-house BBS
Reader service no. 776

Epson Equity LT-386SX
Epson America Inc.
20770 Madrona Ave.
Torrance, CA 90503
800/289-3776
LIST PRICE: with 2MB RAM, 3½-inch 1.44MB floppy drive, 20MB hard disk, one parallel and one serial port, DOS 4.01, battery and AC adapter $5298; same as base model but with 40MB hard disk $5598
ACCESSORIES: 2MB RAM card $799, 2400-bps internal modem $299, carrying case $99
WARRANTY: 12 months parts and labor, carry-in
EXTENDED WARRANTY: available
TECHNICAL SUPPORT: through dealer
OTHER SUPPORT: none
Reader service no. 777

Grid 1450SX
Grid Systems Corp.
47211 Lakeview Blvd.
Fremont, CA
94538-5003
800/222-4743
LIST PRICE: with 1MB RAM, 3½-inch 1.44MB floppy drive, 20MB hard disk, one parallel and two serial ports $4795; same as base model but with 40MB hard disk $5295
ACCESSORIES: 2MB RAM $1090, 4MB RAM $2180; 80387SX coprocessor $506; MNP-5 2400-bps internal modem $595; carrying case $125; AC power supply $210; battery pack $299, enhanced battery pack $399; DOS 3.3 $150, DOS 4.01 $150
WARRANTY: 12 months parts and labor, carry-in
EXTENDED WARRANTY: available
TECHNICAL SUPPORT: toll number, M–F 9–5
OTHER SUPPORT: none
Reader service no. 778

NEC ProSpeed 386SX
NEC Technologies, Inc.
1255 Michael Dr.
Wood Dale, IL 60191
708/860-9500
LIST PRICE: with 1MB RAM, 3½-inch 1.44MB floppy drive, 40MB hard disk, one serial and one parallel port, DOS 4.01, AC adapter $5799; same as base model but with 100MB hard disk $6599
ACCESSORIES: 1MB RAM $599, 2MB RAM $1099, 4MB RAM $1999; MNP-5 2400-bps internal modem $499; expansion chassis $899; battery cartridge $199; carrying case $139
WARRANTY: 12 months parts and labor, carry-in
EXTENDED WARRANTY: available
TECHNICAL SUPPORT: toll number, M–F 8:30–5:30
OTHER SUPPORT: none
Reader service no. 779

Toshiba T3100SX
Toshiba America Information Systems, Inc.
Computer Systems Division
9740 Irvine Blvd.
Irvine, CA 92718
800/457-7777
LIST PRICE: with 1MB RAM, 3½-inch 1.44MB floppy drive, 40MB hard disk, one parallel and two serial ports, DOS 4.01, batteries and AC adapter $5999; same as base model but with 80MB hard disk $6799
ACCESSORIES: 2MB RAM $999, 4MB RAM $2999; 2400-bps modem $349; battery pack $129; external recharger $399; expansion chassis $999; expansion chassis interface card $199; carrying case $99; OS/2 $325
WARRANTY: 12 months parts and labor, carry-in
EXTENDED WARRANTY: available
TECHNICAL SUPPORT: toll-free number, M–F 7–5
OTHER SUPPORT: CompuServe forum, in-house BBS
Reader service no. 780

Zenith SupersPort SX
Zenith Data Systems
1501 Feehanville Dr.
Mt. Prospect, IL 60056
800/553-0331
LIST PRICE: with 1MB RAM, 3½-inch 1.44MB floppy drive, 40MB hard disk, one serial and one parallel port, DOS 3.3, battery pack and AC adapter $5499; same as base model but with 120MB hard disk $6499
ACCESSORIES: 2MB RAM $799; 80387SX coprocessor $799; 2400-bps internal modem $399; rapid-charge battery pack $289; expansion chassis $599; carrying case $59; Zenith Data Systems Windows 3.0 $149
WARRANTY: 12 months parts and labor, carry-in
EXTENDED WARRANTY: available
TECHNICAL SUPPORT: through dealer
OTHER SUPPORT: CompuServe forum, in-house BBS available for purchasers of service plan
Reader service no. 781

ON SITE: PUTTING WINDOWS TO WORK

WHETHER THE PATH TO WINDOWS IS ROUGH OR SMOOTH DEPENDS ON YOUR APPROACH. THREE COMPANIES MAKE THE MOVE—AND LEARN VALUABLE LESSONS.

The benefits of *Windows 3.0* sound irresistible. But is the transition from character-based computing to a graphical world as smooth as Microsoft would have us believe? The answer depends largely on two factors: how quickly you make the switch, and what kind of hardware your organization currently uses.

PC World talked to *Windows* users at organizations ranging in size from a municipal office to a giant bank. We discovered that users take widely varying approaches in implementing *Windows* and often assess the costs and benefits differently.

We also found a spectrum of opinion on how much PC horsepower you want and need to run *Windows*. Some users worked quite happily with 286s, while others recommended more powerful hardware than you might think you need. No one we interviewed, however, was purchasing less than 386SX machines.

ALICE LAPLANTE

ANDY FREEBERG

Genelabs' Bruce Hallberg took a low-pressure approach to switching to Windows, offering it to any employee who wanted to make the switch.

Users were unanimous on another point: Don't expect immediate savings on support dollars when you adopt a graphical user interface (GUI). Despite what many vendors claim, *Windows* requires plenty of training and support.

USERS DEMAND A GUI

For the 26 PC users at city hall in San Carlos, California, it was practically love at first sight when they met *Windows* in late 1988 in the form of *Excel.* Within 18 months, the city had completely changed its computing habits. Microsoft's *Excel, Word for Windows,* and *PowerPoint;* Zenographics' *SuperPrint;* FutureSoft's *DynaComp;* and Micrografx's *Charisma* are the current software standards, says Brian Moura, assistant city manager.

Once the employees decided to jump on the *Windows 3.0* bandwagon, upgrading the existing hardware—eighteen 286 systems and eight 386SXs—became a top priority. The greatest cost was adding memory chips to ten systems that had only 1MB of memory, since Moura saw that the minimum configuration would need at least 2MB. Each machine that needed to be upgraded cost the city $80. Another expense was unanticipated: The ROM BIOS on the office's AST Premium 286 machines was incompatible with *Windows 3.0.* The BIOS upgrade for each Premium 286 machine cost $95. (Labor added further to the total upgrade cost.)

PC users enjoy a lot of flexibility in the small city office, and they played the leading role in the decision to go to a *Windows* environment. The transition from character-based applications to *Windows* packages was gradual and was paced according to each user's wishes.

"Our former spreadsheet standard was *1-2-3,* and everyone left that on their machines until they felt ready to switch over to *Excel,*" says Moura. As individual users grew familiar with *Excel,* they began to use other *Windows* applications. Employees are currently moving from *WordPerfect* to *Word for Windows;* Moura estimates it will be 6 to 12 months before the switch is complete.

Because the transition from the character-based DOS environment to *Windows* was so gradual, support and training were almost nonissues; the employees helped each other by sharing tips and suggestions. To encourage that kind of support, Moura organized a monthly user group.

"I knew *Excel* and *Windows* were firmly entrenched when one employee suggested at the last user group meeting that everyone erase *1-2-3* from their hard drives in order to make room for new *Windows* applications," says Moura. He believes that users' willingness to become proficient in more than one application represents a big productivity edge for *Windows.*

UPGRADES FOR THE '90S #7

Crunch Those Numbers!

Spreadsheet jockeys, CAD freaks, statisticians, scientists, programmers, and other number crunchers, your dreams have come true. If you yearn to fill that empty 80387 math coprocessor socket in your 80386-based PC with some *real* power, Cyrix Corporation has a deal for you. For the same money as Intel's chip, the company will sell you the 83D87, a math coprocessor that's totally compatible with Intel's chip but calculates 20 percent to 300 percent faster. The chip also uses less power, which means a longer life for it and your computer.

Intel is out of the picture, thanks to the FasMath, an 80387 clone that's 20 percent to 300 percent faster.

Installing the FasMath—or any processor—isn't for PC novices, but an experienced user or competent dealer can make the upgrade, which consists of finding the 80387 socket in your system and plugging the FasMath into place. Once there, anything that can tap a math coprocessor—*1-2-3, AutoCAD, Framework*—will run like a greased banana peel. List price: $647 to $994, depending on the speed of the chip. Cyrix Corp., 1850 N. Greenville #184, Richardson, TX 75081; 800/327-6284. —*Robert Luhn*

Reader service no. 727

TONY CARLSON

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TAKING A CONSERVATIVE APPROACH

Genelabs, a biotech research firm in Redwood City, California, that develops antiviral drugs, also committed to *Windows 3.0* under relatively low-pressure, low-cost circumstances. *Windows* currently runs on 60 workstations, and the company hopes eventually to install it on a total of 100 desktops. Bruce Hallberg, MIS director, says his goal is to offer *Windows* to any employee who wants it.

A research organization in which most employees come from academia, Genelabs found Macintoshes in high demand. But Hallberg simply did not have the resources to give each staff scientist a Mac, and *Windows* was the best alternative, providing the graphical interface without the high cost. PCs currently outnumber Macs at Genelabs 8 to 1.

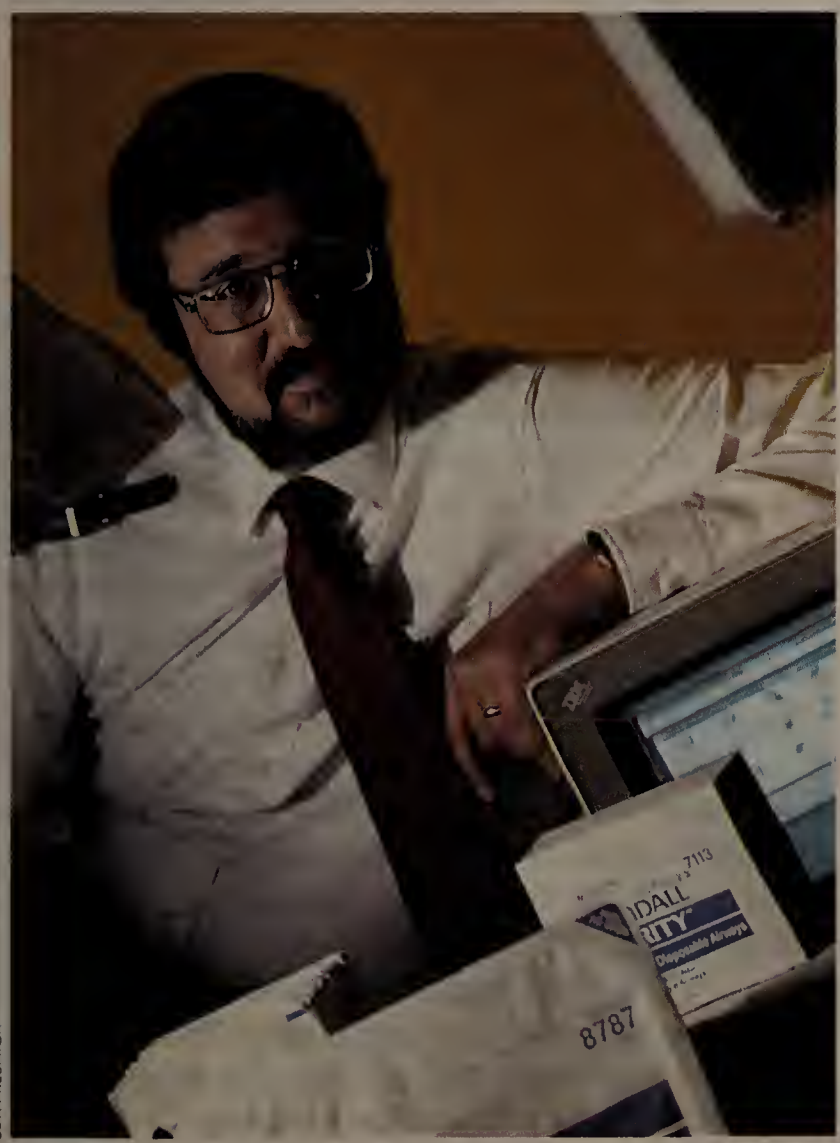
The company runs *Windows* on 286 machines, using popular off-the-shelf software like *Microsoft Word* and *Excel*. Genelabs can get away without using 386s because employees have little need for multitasking—a feature that increases requirements for horsepower and memory. "Mostly my users want to get the benefit of the graphical interface," Hallberg explains.

"Our new standard PC is a 386SX," he says. "We're not buying 286 systems any longer, but we don't have to throw away the ones we have, either. Users can still get the benefit of the interface without the expense of an upgrade"—a cost that could run as high as $500, depending on the PC. All of Genelabs' machines—286s and 386s—needed memory upgrades at $300 to $500 apiece. The company's installed base of IBM PC XTs isn't adequate for running *Windows*, so the organization is selling the XTs to employees cheap or donating them to charity.

Hallberg says the chief advantage to the somewhat conservative adoption scenario he chose was cost savings: Previously, his firm simply couldn't afford to implement a graphical interface on a companywide scale. "Costs are lower if you wait," he reasons. "Certainly the 386SX is a lot cheaper now than it was two years ago. Also, *Windows* software is more mature. Frankly, for an R&D company such as ours, waiting a couple of years makes a big difference. We get the advantages of a GUI but at a substantially lower cost."

Like many *Windows* users, Hallberg sees the environment as an interim standard rather than a permanent one. "OS/2 will replace *Windows*, but not for a couple of years," he predicts. "At that time, we can look at our hardware require-

BOB HOLMGREN



SETH RESNICK

Kendall Healthcare Products' Roy Wilsker (left) and Brian Moura (above), assistant city manager with the city of San Carlos, California, both found that upgrading their users' systems was the top priority when it came time to move to Windows 3.0. Both organizations now buy only 386 systems for users running Windows.

ments and reevaluate the situation. Because Presentation Manager applications will have the same interface as *Windows 3.0* applications, however, users will be in a good position to switch over with little fuss."

READY TO TAKE A (CAREFUL) PLUNGE

At Kendall Healthcare Products in Mansfield, Massachusetts, employees are making the move to *Windows* gradually. A cautious approach was the only way to move toward a GUI, says Roy Wilsker, manager of end-user computing. "The idea of such an interface was terrific, but the product wasn't worth the heartache and expense until recently," he says.

Wilsker and his staff have been evaluating *Windows* for several months, not only in standard benchmark and technical tests but also in real-world applications. *Windows 3.0* currently runs on about 30 machines among systems and administrative support staff, handling office automation tasks such as word processing, spreadsheet, and data base management. In these prototype installations, Wilsker and his staff have duplicated actual business use to see whether the new environment will hinder day-to-day work.

JONATHAN LEVINE

Manufacturers Hanover Trust made an early commitment to Windows, an investment that has paid off handsomely, says the bank's senior technical officer, Stephen Morse.

"Often the best way to implement a new technology is not through a full-blown pilot but in a staggered way," Wilsker says. The company is installing *Windows* department by department, being careful not to disrupt the real business that must go on. "Our worst fears are that a technology will work so poorly that a department won't be able to function."

Kendall Healthcare is an independent $400 million firm, with about 500 employees at the Massachusetts location. Most PCs in the organization are connected to IBM midrange systems; the firm has everything from 8088 to 80386 PCs installed on users' desks, but 8088 and 80286 machines dominate. As a result, upgrading hardware will be a top priority—and a staggering expense—as the company moves to *Windows*.

Approximately 150 users want to upgrade to *Windows* immediately, but only a handful—15 or 20—have the hardware to support the environment. "We figure we're going to have to increase the hard disk sizes and memory on 386 machines, get rid of a lot of old PCs and XTs, and replace them with newer machines," says Wilsker. He estimates that the replacement cost could be as high as $3000 per system.

"When we decided that we were probably going to go with *Windows 3.0,* one of the first things we did was revise our entry-level–system requirements," Wilsker says. Kendall Healthcare now buys only 386 and 386SX systems, each with at least VGA, an 80MB hard drive, and 3MB of RAM. The company has instituted a hand-me-down policy for its older-technology PCs.

A key reason for adopting *Windows* was the hope that the move will lessen the demands on Wilsker's staff, reducing the number of calls to the "help desk" as well as the need for training classes. So far, this hasn't happened. Instead, Wilsker finds he is just getting different kinds of calls. When users started playing with *Ami Professional* or *Word for Windows,* for example, Wilsker started hearing more sophisticated questions about hot linking spreadsheets to word processors, importing graphics, and other desktop publishing issues. "The new interface and functionality raise user expectations and actually create more support calls," Wilsker says.

ON THE BLEEDING EDGE—HAPPILY

Manufacturers Hanover Trust jumped into *Windows* feetfirst three years ago and hasn't looked back. The New York bank's wholesale banking sector started experimenting with *Windows* in 1987 and first implemented version 2.03 in a pilot project within the systems department. Currently, more than 2500 copies of *Windows* are installed, with both professional employees and support staff using it for word processing and financial analysis.

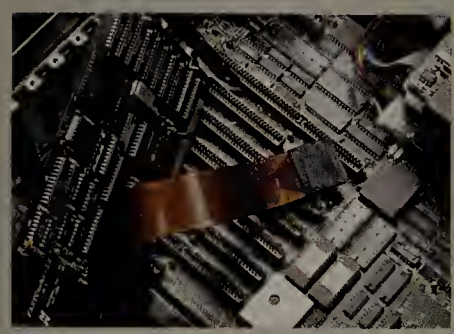
Manufacturers Hanover saw three reasons for committing to *Windows,* according to senior technical officer Stephen Morse: to provide users with a consistent interface from one application to another, to give them the ability to multitask,

UPGRADES FOR THE '90S #8

386 Your AT

The 80386 is clearly the microprocessor for the '90s—but if you're stuck with an 80286-based PC from the '80s, you can make a cost-effective upgrade: Pop a 16-MHz or 20-MHz 386 FastCache-SX board into any 8/16-bit slot. You'll get 85 percent of the speed of a comparable 386SX PC, the ability to run 16- and 32-bit software (*Windows, Desqview 386,* Xenix, and more), plus a socket for the 80387SX math coprocessor. The board even uses the RAM already installed in your system.

However, installing the FastCache-SX isn't for upgrade newcomers. The ugly stuff includes taking out your computer's 80286 and 80287 chips, plugging a special cable into the FastCache board and the vacated 80286 socket, and installing software that switches on the board's caching scheme. Once the FastCache is in place, your machine will zoom like an F-16.



Installing this 386 turbo board isn't for novices, but the card is cheap and plenty fast.

TONY CARLSO

Note: Some 6-MHz and 8-MHz IBM ATs will require a $50 BIOS ROM upgrade from MicroWay. The company's cache can also conflict with some SCSI drives, so you may have to disable it. Remember, there's no gain without pain in Upgrade Land. List price: 20 MHz $595, 16 MHz $495; installation kit for 6-MHz AT $50, cable kit for 8-MHz AT $95; Phoenix BIOS $50, 16-MHz 80387SX $280, 20-MHz 80387SX $300. MicroWay, Research Park Box 79, Kingston, MA 02364; 508/746-7341, 508/746-4678 (fax). —*Robert Luhn*

Reader service no. 728

and to enable them to share data among applications via *Windows'* DDE capability.

Morse says he and other bank officials saw the attraction of these features in their first *Windows* demonstration. "There was no doubt this was the future," he says. He was also given a generous charter from the bank's senior managers: Spend as much as you want in order to provide employees with the best strategic advantage. As a result, in terms of hardware, Manufacturers Hanover thought big—really big—for 1987, providing employees with fully loaded 386 systems. Last year the ante was raised even higher, and 486 systems are now being installed as the standard machine for all Manufacturers Hanover employees.

The first year, at least 500 *Windows* workstations were rolled out. The bank was confident that the long-term advantages would justify the initial outlay. "It was popular to say when the 386 was first introduced that only 'power users' would need them," says Morse. "So we redefined the term to mean people who needed a casual approach to power—people who couldn't afford to be worrying about bumping against a technology ceiling."

Another strategy that may have been unique for 1987 was the decision to eliminate hard disk drives on *Windows* systems and network all workstations together. The key issue was security—the information being processed was strategic, and the bank couldn't afford to take chances with data loss or corruption—but an additional benefit was lower costs for both systems and service contracts.

To be sure, installing the fledgling *Windows* environment on a network was risky, and working out bugs and incompatibilities was time-consuming. Being a *Windows* pioneer meant Morse and his colleagues spent a lot of time working with software vendors struggling to bring out the very first *Windows* packages, and this commitment turned out to be very expensive: Not only did the bank put up "seed money," it also allowed employees to take substantial time away from their bank jobs to work on third-party software.

But the risks and expense of being a *Windows* pioneer were worthwhile, Morse says. "We now have a strategic system in place at a time when other organizations are only getting started."

Alice LaPlante is a freelance writer in Palo Alto, California.

A crisper, more colorful screen means a better work environment —especially if you use Windows. Our guide to 126 boards and monitors points the way to cost-effective, better-than-VGA graphics.

FRED STIMSON

HARDWARE SPECIAL ISSUE

DISPLAYS THAT OUTSHINE VGA

TJ BYERS AND ERIC KNORR

You're on the showroom floor, and a salesman (call him Harry) has you buttonholed. All you want is a VGA board and a monitor. But Harry insists that for just a little more money, you'll get more than twice the resolution and a magnitude more colors. An alarm goes off in your head. You've heard this routine before. "Sounds good, Harry, but what software can I use with it?"

Good question.

At resolutions higher than VGA, you can't depend on widespread software compatibility. Boards that throw more pixels on the screen than the IBM VGA's 640 by 480 usually come with their own meager assortment of software drivers on disk. Each driver, once you take the trouble to install it, lets you run a single program at a fixed beyond-VGA resolution. Most boards include drivers for a few CAD, business, and desktop publishing applications, plus (last but not least) *Windows*.

If you're a *Windows* user, Harry's deal may be a hot one. Install a *Windows* driver for a beyond-VGA resolution, and most *Windows* applications will benefit—without your having to install a separate driver for each one. You get smaller text that's still quite readable, often enabling you to see more of each application when several windows share the screen. In other words, a sharper image can make *Windows* really sing.

With the benefits of *Windows* foremost in mind, we've designed this Buyers' Guide to help you navigate the territory beyond VGA. As usual, we start with the most important question: What will you use your hardware for? Based on your response, we suggest the best configurations, which you can match against our listing of 126 boards and monitors. But first let's decode some jargon and prepare you for close encounters with fast-talking salespeople.

TWO STEPS FORWARD

What lies beyond VGA? Graphics hardware solutions for professional CAD and desktop publishing abound, ready to soak up any amount of money you'd care to spend. But in this guide, we assume you're concerned with graphics hardware for mainstream business PCs, particularly *Windows* workstations. We'll focus on the most popular, cost-effective boards and monitors—those that support 800 by 600 and 1024 by 768 resolutions in either 16 or 256 colors.

When you buy a VGA graphics board, you usually get at least 800 by 600 capability—which is why just about every advertisement for a VGA board uses the term *super VGA*. If you want a super-VGA board that does 256 colors at this resolution, or one that raises the stakes to 1024 by 768 at 16 colors, you'll generally pay only $50 to $100 more than the basic board's typical $100 to $300 street price.

Buying a monitor needn't cost you a bundle either. A typical *multiscan* monitor, which handles both 800 by 600 and 1024 by 768 resolutions, goes for $500 to $600 on the street—only $75 to $150 more than a typical VGA-only monitor. Of course, multiscans are also fully compatible with the VGA standard, and both VGA and multiscan monitors can handle any number of colors.

You won't go broke buying a basic super-VGA board and a multiscan, but you may experience difficulties in performance and image quality—especially at 1024 by 768. At that resolution, your super-VGA board may turn super slow; up the color ante from 16 to 256, and you may wait all day. Moreover, most multiscans support only *interlaced scanning* at 1024 by 768. That means the electron gun inside the monitor takes two passes to create an image instead of one, causing screen flicker.

How do you solve these problems? Easy: Spend more money. Boards with special *graphics coprocessors* can speed performance immensely, but they add anywhere from $300 to thousands of dollars to the street price. As for monitor quality, multiscans that look good at 1024 by 768—that is, those that support *noninterlaced* scanning at that resolution—cost as little as $200 more.

If you long for the room to manipulate multiple applications freely, and money is no object, you might want to consider a large monitor. Garden-variety multiscans generally measure no greater than 14 inches diagonally; at 1024 by 768, text can be a bit small for easy reading. Take the step up to a 16-inch monitor, and you'll easily pay double the price of a 14-inch unit. And since you'll be running at 1024 by 768, you'll also want a pricey graphics coprocessor board. Prices are dropping all the time—NEC recently reduced the list price of its noninterlaced, 16-inch MultiSync 4D to $1500—but few *Windows* business users can justify such big-screen luxury.

WORD PROCESSING, SPREADSHEETS, AND DATA MANAGEMENT

If you use general business applications, you spend most of your time manipulating text, even within a graphics environment like *Windows*, and a basic super-VGA board running at 800 by 600 in 16 colors on a 14-inch multiscan should do just fine. You'll be able to see more on screen—about one and a half times the *Windows* desktop at standard VGA resolution. Text will be slightly smaller, but the characters will be sharp and easy to read.

You might not even need to buy new hardware to get 800 by 600 resolution. Remember that nearly every VGA board made does 800 by 600, so there's a good chance yours can. Moreover, you might have a multiscan monitor and not even know it. So if you're not sure what kind of monitor you have, check our multiscan table. If you don't see your model, contact the manufacturer: You may have a multiscan that's been discontinued.

If your VGA is built into the PC's main system board, you've probably got VGA-only hardware. In that case, going beyond VGA means starting from scratch. Not only do you need to buy and install a new board and monitor, but you'll

NEW MONITORS REDUCE EYESTRAIN

Recent studies show that the eyestrain and fatigue you experience from staring at the screen are caused in large part by screen flicker, which occurs when the screen image fades before the PC has time to refresh it. The effect, similar to an old-time nickelodeon show, occurs at a rate so fast you may not see it—but your eyes feel it.

The best way to reduce flicker is to increase the number of times per second the screen is redrawn. In technical terms, this is known as increasing the refresh rate.

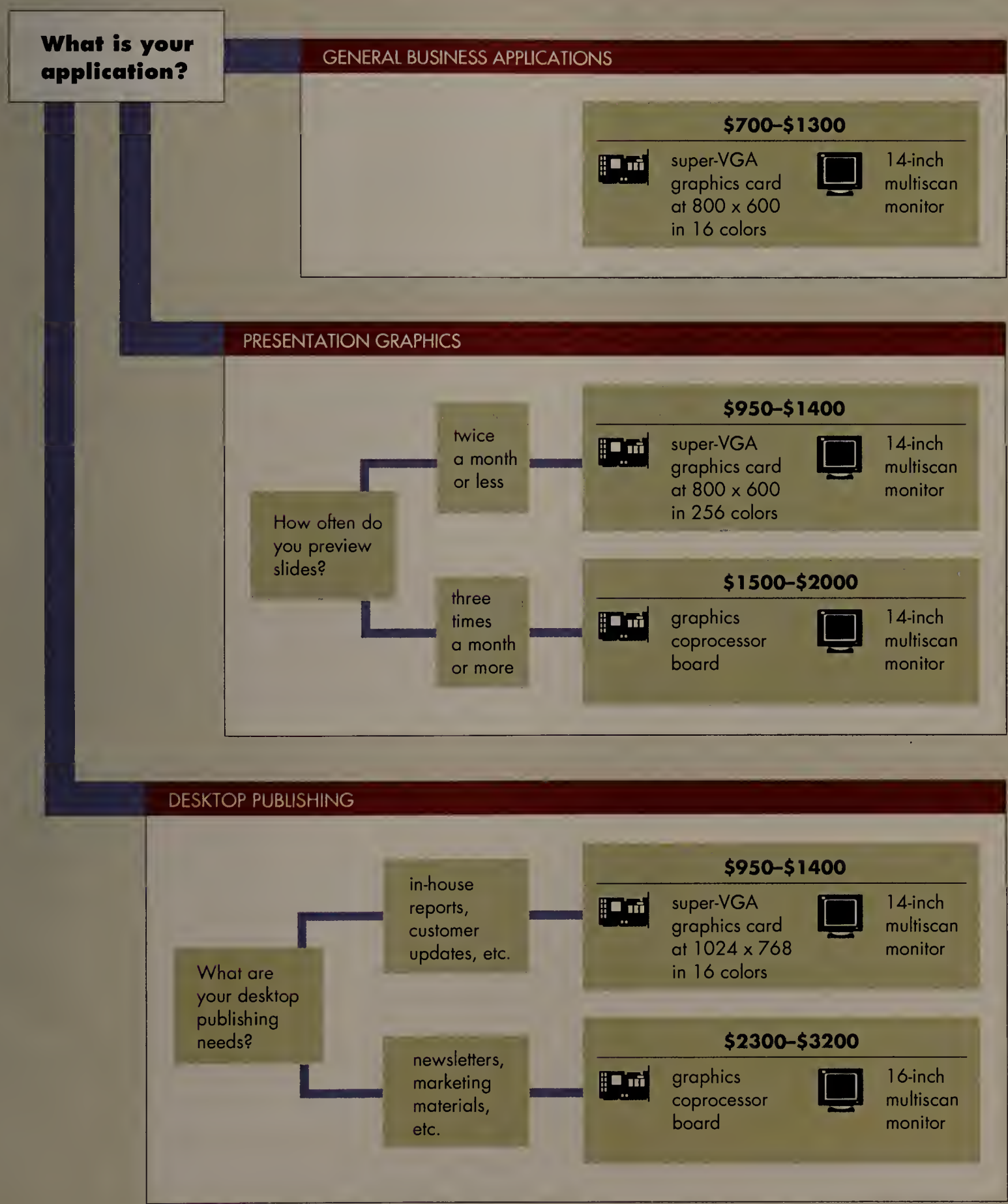
A new standard proposed by the Video Electronics Standards Association (VESA) increases the refresh rate from the current 60-Hz standard (redrawing the screen 60 times a second) to 72 Hz for 640 by 480 and 800 by 600 resolutions. This strain-reliving technique offers the added bonus of slightly crisper text and graphics.

Currently, only top-of-the-line multiscan monitors (noninterlacing 1024 by 768 models) support the new refresh rate. But help may be on the way. A number of European countries are demanding 72 Hz as a minimum standard, which should increase manufacturing volumes and lower the cost of this healthy technology. —*TJB*

KNOW YOUR OPTIONS

All the Way With Super VGA—And Beyond

Like the yellow brick road, the path beyond VGA splits three ways. Fortunately, the destinations are clearly indicated, depending on what applications you emphasize.



MULTISCAN MONITORS

Manufacturer	Product	Price	Screen size (inches)	Dot pitch (mm)	RESOLUTIONS SUPPORTED: VGA	800x 600	Interlaced 1024x768	Non-interlaced 1024x768	72-Hz refresh	Supports digital boards	Warranty (years)	Reader service number
AAMAZING TECHNOLOGIES	CM-61428S	$639	14	0.28	Y	Y	Y	N	N	N	1	868
	CM-61728	$1799	17	0.28	Y	Y	Y	Y	Y	N	1	868
	CM-8426	$899	14	0.26	Y	Y	Y	Y	Y	Y	1	868
ACER TECHNOLOGIES	7015	$695	14	0.28	Y	Y	Y	N	N	Y	1[1]	869
	AcerView 33	$745	14	0.28	Y	Y	Y	N	N	N	1[1]	869
	AcerView 35	$995	14	0.26	Y	Y	Y	Y	Y	N	1[1]	869
AMAX ENGINEERING	Impression AX414E	$499	14	0.28	Y	N	Y	N	N	N	1	870
AMDEK	SmartScan II	$749	14	0.28	Y	Y	Y	N	N	N	1	871
COMPAQ COMPUTER	Advanced Graphics Colar	$1699	16	0.29	Y	N	Y	Y	Y	N	1	872
ELECTROHOME	ECM 1310	$1259	14	0.31	Y	Y	Y	N	N	Y	1	874
GOLDSTAR TECHNOLOGIES	1450 Plus	$699	14	0.31	Y	Y	N	N	N	N	1	875
	1460 Plus	$799	14	0.28	Y	Y	Y	N	N	N	1	875
	1610 Plus	$1199	16	0.31	Y	N	Y	N	N	N	1	875
HITACHI/NSA	14MVX	$895	14	0.28	Y	Y	Y	N	N	N	2	876
IBM	8514	$1665	16	0.31	Y	N	Y	N	N	N	1	877
	8515	$950	14	0.28	Y	N	Y	N	N	N	1	877
IOCOMM	ThinkSync Trio CM-4210	$549	14	0.28	Y	Y	Y	N	N	N	1	878
LEADING TECHNOLOGY	1428S	$399	14	0.28	Y	Y	N	N	N	Y	1	879
MAGNAVOX	6CM320	$799	14	0.28	Y	Y	Y	N	N	N	2	880
	7CM320	$799	14	0.28	Y	Y	Y	N	N	N	2	880
MITSUBISHI	FA3435ATK	$1280	14	0.28	Y	Y	Y	N	N	Y	1	881
	Diamand Scan 14	$889	14	0.31	Y	Y	Y	N	N	Y	1	881
	Diamand Scan 16L	$1945	16	0.31	Y	Y	Y	Y	Y	N	1	881
NANAO	Flexscan 8060H	$899	14	0.31	Y	Y	Y	N	N	Y	1	882
	Flexscan 8060S	$939	14	0.28	Y	Y	Y	N	N	Y	1	882
	Flexscan 9070U	$1779	16	0.28	Y	Y	Y	Y	Y	Y	1	882
NEC TECHNOLOGIES	MultiSync 2A	$799	14	0.31	Y	Y	N	N	N	Y	1	883
	MultiSync 3D	$1049	14	0.28	Y	Y	Y	N	N	Y	1	883
	MultiSync 4D	$1799	17	0.28	Y	Y	Y	Y	Y	Y	1	883
PACKARD BELL	Model 8510	$899	14	0.28	Y	Y	Y	N	N	N	1	884
PANASONIC	PanaSync C1381	$699	14	0.28	Y	Y	Y	N	N	N	1	885
	PanaSync C1391	$799	14	0.28	Y	Y	Y	N	N	Y	1	885
PC CRAFT	VGAM/1024	$595	14	0.28	Y	Y	Y	N	N	N	1	886
PRINCETON	Ultra 1200	$849	14	0.28	Y	Y	Y	N	N	Y	5/2[2]	887
	Ultra 1400	$899	14	0.28	Y	Y	Y	N	N	Y	5/2[2]	887
	Ultra 1600	$1375	16	0.31	Y	Y	Y	N	N	Y	5/2[2]	887
RELISYS	RE5155	$745	14	0.31	Y	Y	Y	N	N	Y	1	888
	RE1520	$995	15	0.31	Y	Y	Y	Y	Y	N	1	888
SAMPO	AlphaScan	$789	14	0.31	Y	Y	Y	N	N	Y	1	889
SAMSUNG	SyncMaster 1	$799	14	0.31	Y	Y	Y	N	N	Y	1	890
	SyncMaster 2	$729	14	0.31	Y	Y	Y	N	N	N	1	890
	SyncMaster 3	$799	14	0.28	Y	Y	Y	N	N	N	1	890
SEIKO	CM-1440	$849	14	0.25	Y	Y	Y	N	N	N	1	891
	CM-1450	$999	14	0.25	Y	Y	Y	Y	Y	N	1	891
SONY	Multiscan CPD-1302	$995	14	0.25	Y	Y	Y	N	N	Y	1	892
	Multiscan CPD-1304	$1095	14	0.25	Y	Y	Y	Y	Y	N	1	892
TATUNG	CM-1496X	$749	14	0.31	Y	Y	Y	N	N	N	1	893
	CM-1498X	$799	14	0.28	Y	Y	Y	N	N	N	1	893
	CM-1495G	$899	14	0.31	Y	Y	Y	N	N	Y	1	893
TAXAN	Super Visian 790	$799	14	0.28	Y	Y	Y	N	N	N	1	894
	Multi Visian 795	$1095	14	0.26	Y	Y	Y	Y	Y	N	1	894
TVM PROFESSIONAL	SuperSync 2A+	$695	14	0.28	Y	Y	N	N	N	N	2	895
	SuperSync 3A	$745	14	0.28	Y	Y	Y	N	N	N	2	895
	SuperSync 5A	$1099	15	0.28	Y	Y	Y	Y	Y	N	2	895
T.W. CASPER	TM 5156H	$315	14	0.31	Y	Y	Y	N	N	N	1	896
VIEWSONIC	ViewSanic 4	$599	14	0.28	Y	Y	Y	N	N	N	1	897
	ViewSonic 5	$995	14	0.25	Y	Y	Y	Y	Y	N	1	897
XTRON	CM 140UV	$388	14	0.28	Y	Y	Y	N	N	N	1	898

[1] Includes four months on-site service.
[2] Two years replacement warranty on CRT; five years on all labor and replacement for all other parts.

For more information about all products in this table, circle reader service no. 909.

also have to find the system manual and figure out how to disable the built-in VGA.

PRESENTATION GRAPHICS

Let's say that doing the occasional slide show is part of your job. If you use presentation graphics software to create your slides, then you want to see a reasonably accurate representation of them on screen *before* you send the finished image files to a slide service.

Slide jockeys should opt for boards with 256-color drivers. Professional-looking slides often use subtle background shading, and presentation graphics packages that support 256 colors—such as *Charisma* or *PowerPoint* under *Windows 3.0*—need that many hues to simulate shading adequately on screen.

The downside is that a 256-color image at any resolution—even 640 by 480—hobbles performance considerably, and with super VGA you may bide your time waiting for that colorful screen to redraw.

That won't be a problem with a graphics coprocessor board, worth springing for if you create slides more than two or three times a month. Otherwise, you can probably live with the sluggish performance of a super VGA running at 640 by 480 or 800 by 600 in 256 colors, since the slowdown occurs only when you work with a 256-color application; with ordinary 16-color business applications, speed is unaffected.

DESKTOP PUBLISHING

Not everyone can afford a full-page monitor or a 23-inch, two-page display, and not every desktop publisher needs one. If you primarily use business applications but do light desktop publishing on the side, it makes sense to opt for less expensive hardware.

Still, if you put out a regular newsletter or create marketing materials on a budget, you need 1024 by 768 resolution at a minimum, along with a 16-inch monitor so you can read tiny type on a full (or close to full) page. You also need a high-performance coprocessing board. With a super VGA, you'll likely endure painfully slow performance as you pour, reformat, scroll, zoom, and redraw.

For less demanding publishing tasks, such as customer updates or important in-house reports, you can use super VGA at 1024 by 768 with a 14-inch multiscan as a kind of page preview. It'll be slow, but with fewer graphics and less fine tuning, you won't need to interact as much with the display. And it's still faster than printing out proof after proof.

Now that both *PageMaker* and *Ventura* run under *Windows*, you can install a *Windows 3.0* driver and take your pick. Every video board worth its salt has a 1024 by 768 driver for *Windows* as well as for *Ventura* under *GEM*. Unfortunately, 1024 by 768 drivers for such capable light-duty programs as *Publish-It*—an excellent program for occasional users—are hard to find.

Finally, unless color output is a must, serious desktop publishers prefer monochrome boards and displays: Why pay for color when you can invest in higher resolution instead? But for users of *Windows* business applications who employ *PageMaker* part time, it's not worth sacrificing color, an integral part of the *Windows* environment, especially in version 3.0. Losing it would take away half the fun.

WHEN YOU KNOW WHAT YOU WANT...

The rest is easy. Well, sort of. Assuming we've helped you decide which beyond-VGA setup you want to buy, the next

UPGRADES FOR THE '90S #9

A Faster, More Efficient Memory Manager for Windows 3.0

As *Windows 3.0* users know, more is better—especially when it comes to memory. Although *Windows'* HIMEM.SYS and EMM386.SYS do a fair job of managing a 386-based system's memory, there is in fact a better way to do it: *QEMM-386 5.1* from Quarterdeck Office Systems.

Run *QEMM-386's* speedy automatic install program, then load *Windows* in *any* mode, and you'll notice how perky the environment becomes. That's because *QEMM-386 5.1* frees up conventional RAM by enabling you to place drivers, TSRs, and network programs and shells in the space between 640K and 1024K. Run *Windows* in real or standard mode, and *QEMM-386* takes over the role of expanded memory manager.

Not only is *QEMM-386* faster and more efficient than *Windows'* own memory manager, it uses only a fifth as much RAM. The program will even let you run 386-specific programs (such as *Paradox 386*) in *Windows'* real mode. Other *Windows 3.0*–compatible memory managers are on the way, but for now, *QEMM-386 5.1* leads the pack. List price: $99.95. Quarterdeck Office Systems, 150 Pico Blvd., Santa Monica, CA 90405; 213/392-9851, 213/314-3214 (fax). —*Robert Luhn*

Reader service no. 825

SUPER-VGA BOARDS

Manufacturer	Product	List price with RAM	RAM increments	COLORS AVAILABLE FOR WINDOWS 3.0: VGA 640x480	800x600	Interlaced 1024x768
AHEAD SYSTEMS	VGA Wizard	$199/$259	256K/512K	16/256	16/256	0/16
	VGA Wizard Deluxe	$299/$369/$449	256K/512K/1MB	16/256	16/256/256	0/16/256
AMAX ENGINEERING	Impression Card	$134/$184	256K/512K	16/256	16/256	0/16
AST RESEARCH	AST-VGA Plus	$329	256K	16/256	16	0
ATD TELEVIDEO	ATD VGA	$147	256K	16	16	0
ATI TECHNOLOGIES	VGA Wonder+	$379/$479[1]	256K/512K	256	16/256	4/16
BOCA RESEARCH	Super VGA by Baca	$195/$245	512K/1MB	256/256	256/256	16/256
CARDINAL TECHNOLOGIES	VGA400	$299	256K	16	16	0
	VGA500	$369/+256K[2]	256K/512K	16/256	16/256	0/16
	VGA600	$389	512K	256	16	16
	VGA700	$499/+512K[2]	512K/1MB	256	256	16/256
DIAMOND COMPUTER SYSTEMS	SpeedStar VGA	$445/$495	512K/1MB	256	256	16/256
EVEREX SYSTEMS	Viewpoint VGA	$239/$299	256K/512K	256	16	16
	Viewpaint VRAM	$499/$699	512K/1MB	16/256	16/256	16/256
GENOA SYSTEMS	SuperVGA 6300	$249	256K	16	16	16
	SuperVGA 6400	$299	512K	256	256	16
HEADLAND TECHNOLOGY	Video Seven V-RAM VGA	$597	512K	256	16	0
	Video Seven VGA 1024i	$347/$397	256K/512K	256	16	16
LEADING TECHNOLOGY	VGA Level 16+	$99	256K	16	16	0
	VGA Super 16	$127/$177	256K/512K	16/256	16/256	0/16
MAXLOGIC	MaxVGA/16	$199	256K	16	16	0
	MaxVGA 1024	$239/$299	256K/512K	16/256	16	16
METHEUS	Premier VGA	$499/$599	256K/512K	16/256	16	0/16
MICRO EXPRESS	Extended VGA Card	$249/$289/$369	256K/512K/1MB	16/256/256	16/256/256	0/16/256
MICRO-LABS	VGA Solution	$275/$325	256K/512K	16/256	16/256	0/16
	Ultimate VGA	$350/$425	512K/1MB	256	256	16/256
ORCHID TECHNOLOGY	PraDesigner/E	$329/$364	256K/512K	256	16/256	16
	PraDesigner II	$469/$569	512K/1MB	256	256	16/256
PACKARD BELL	PBS VGA	$289	512K	256	256	16
PRISM IMAGING SYSTEMS	EXCELSIOR	$899	1MB	256	256	256
SIGMA DESIGNS	SigmaVGA Legend	$449/$569	512K/1MB	256	16/256	16/256
SOTA TECHNOLOGY	Sota VGA 16+	$295/$345[3]	256K/512K	16/256	16/256	0/16
STB SYSTEMS	VGA 800/16	$219	256K	16	16	0
	PowerView VGA	$249/$269	256K/512K	256	16	16
	PowerGraph VGA	$349/$399/$499	256K/512K/1MB	256	16/256/256	16/16/256
	ErgoVGA	$349/$399/$499	256K/512K/1MB	256	16/256/256	16/16/256
TATUNG	OmniVGA	$449	512K	256	256	16
	OmniVGA/HR	$289/$339	256K/512K	16/256	16/256	4/16
	VGA/AD	$580	512K	256	256	16
TRIDENT MICROSYSTEMS	TVGA 8916	$245/$295/$495	256K/512K/1MB	256	16/256	4/16/256
VIEWSONIC	P800	$189	256K	16	16	0
	P1024	$209	256K	16	16	4
	1024AM	$269	256K	16	16	4
WESTERN DIGITAL IMAGING	Paradise VGA Plus 16	$329	256K	16	16	0
	Paradise VGA 1024	$369/$469	256K/512K	16/256	0	16
ZYMOS	Super RVGA II	$449/$578	256K/512K	16/256	16/256	0/16

[1] Price includes mouse port and mouse.

[2] RAM upgrade not available from company.

[3] Price includes mouse port.

step is to familiarize yourself with the features to consider when choosing among comparable boards and monitors. The following covers the basics for super-VGA boards, graphics coprocessor boards, and multiscan monitors.

Super-VGA Boards

The list prices of super-VGA boards veer wildly from $99 all the way to $899, so take a good close look at what you're getting. In most cases, pricier boards run faster, offer higher resolutions, and support more colors.

COMPATIBILITY All the boards listed come with special high-resolution drivers for *Windows 3.0*. Outside of *Windows*, you'll likely find 132-column text drivers for *1-2-3*,

Non-interlaced 1024x768	BIOS relocation available	Has DIP switches to set	Runs in 12.5-MHz bus	Supports 72-Hz refresh	Warranty (years)	Reader service number
0/16	Y	N	Y	Y	1	840
0/16/256	Y	Y	Y	Y	1	840
0	Y	Y	Y	N	1	841
0	Y	N	Y	N	2	842
0	N	Y	N	N	1	843
4/16	Y	N	N	Y	2	844
16/256	Y	N	Y	Y	5	845
0	Y	Y	Y	Y	1	846
0/16	Y	N	Y	Y	1	846
16	Y	Y	Y	Y	1	846
16/256	Y	N	Y	Y	1	846
16/256	Y	N	Y	N	5	847
0	Y	Y	N	N	2	848
16/256	Y	Y	Y	N	2	848
16	Y	Y	Y	Y	1	849
16	Y	Y	Y	Y	1	849
16	Y	Y	Y	N	7	850
0	Y	Y	Y	N	7	850
0	Y	Y	N	N	1	851
0	Y	N	N	N	1	851
0	Y	Y	Y	Y	2	852
0	Y	Y	Y	Y	2	852
0/16	Y	N	Y	N	2	853
0/16/256	Y	N	Y	Y	2	854
0	Y	Y	N	N	3	855
16/256	Y	N	N	N	3	855
16	Y	Y	Y	Y	4	856
16/256	Y	Y	Y	Y	4	856
16	Y	Y	N	N	1	857
256	Y	Y	Y	Y	unlimited	858
16/256	Y	Y	N	Y	1	859
0/16	Y	N	Y	N	2	860
0	Y	N	Y	N	2	861
16	Y	N	Y	N	2	861
16/16/256	Y	N	Y	N	2	861
16/16/256	Y	N	Y	Y	2	861
0	Y	Y	Y	Y	1	862
4/16	Y	Y	Y	Y	1	862
16	Y	N	Y	Y	2	862
0	Y	Y	Y	Y	2	863
0	Y	Y	N	N	1	864
0	Y	Y	N	N	1	864
0	Y	Y	N	N	1	864
0	Y	Y	Y	N	3	865
0	Y	Y	Y	N	3	865
0	Y	Y	N	N	2	867

For more information about all products in this table, circle reader service no. 908.

Symphony, and *Framework,* plus 800 by 600 and 1024 by 768 drivers for *Ventura* and *AutoCAD.*

Never buy a board and monitor without test-driving the two together. In the worst cases, at beyond-VGA resolutions, you may get jittery images that no amount of fiddling with monitor controls can stabilize. In addition, if you plan to run a super-VGA board at 1024 by 768, it's a good idea to buy a board that does both interlaced and noninterlaced scanning at that resolution. The capability doesn't cost much, and you may want to upgrade to an interlaced monitor later.

Don't forget that you can always fall back on good old VGA. Every multiscan and virtually every software package sold supports the IBM VGA standard, which all super-VGA–board manufacturers have implemented. This standard enables you to run even old software written for the CGA, EGA, and original IBM monochrome boards. In addition, most super-VGA boards go IBM's one better by running software written for the Hercules Graphics Card.

PERFORMANCE You can't tell which boards are fastest just by looking, and testing can be deceptive unless benchmarks match your work routine precisely. However, a couple of general guidelines can help you narrow the field.

First, if you use a 286 machine, don't worry about the board's performance: The 286 processor will be the bottleneck, not the super-VGA board. Second, if you use a fast 386 and don't mind spending money on speed, get a board that uses VRAM. It doesn't make a board fast by itself (many factors come into play), but it is expensive, so manufacturers don't use it on slow boards.

Two other features can help move those pixels along. Video BIOS relocation, a routine that automatically copies from firmware on the video board into a system's fast memory, speeds performance with some applications. (It also can cause compatibility problems with some systems, which is why all the boards listed let you turn the feature off.) Furthermore, if you use a PC that lets you turn up the speed of the expansion bus from the usual 8 MHz to 12.5 MHz, you can get a substantial performance boost if your super-VGA board is compatible with that speed.

VIDEO MEMORY Every super-VGA board has at least 256K of RAM, which is enough to display 800 by 600 graphics at 16 colors. For 1024 by 768 at 16 colors or 800 by 600 at 256 colors, you need 512K of RAM; for 256 colors at 1024 by 768, you need a full 1MB. Some boards' RAM capacity is fixed, but most come with 256K and can be upgraded to 512K. The latter arrangement provides the most flexible, cost-effective solution for most business users.

INSTALLATION If you plan to use your super-VGA board as a plain old VGA, installation is usually just a matter of sticking the board in an expansion slot and hooking up a VGA-only or multiscan monitor. To get super-VGA capabilities, however, you need to run an installation routine and select the appropriate driver. *Windows 3.0* makes this easy: When the setup routine detects a VGA, you select *Other,* and *Windows 3.0* will prompt you to put the driver disk in the A: drive.

Most boards come with a wide selection of software options that you'll probably never touch. Should you need to activate a special emulation mode or disable features that cause compatibility problems, however, it's nice to have a board that lets you do this with a utility. Otherwise you'll have to fiddle with DIP switches, and unless the switch block is accessible from the board's rear bracket, that means opening up your PC.

QUALITY A nice long warranty is the best quality assurance. But when you explore beyond-VGA resolutions, soft-

GRAPHICS COPROCESSOR BOARDS

Manufacturer	Product	List price with VRAM	VRAM increments	COLORS AVAILABLE FOR WINDOWS 3.0: VGA 640x480	800x600	Interlaced 1024x768
ARTIST GRAPHICS	XJi	$1795/$2395	384K/768K	0	16/256	0
ATI TECHNOLOGIES	8514/Vantage	$699/$849	512K/1MB[2]	0	0	16/256
	8514/Vantage + VGA	$899/$1049	512K/1MB[2]	256	16	16/256
	8514/ULTRA	$899/$1099	512K/1MB	0	0	16/256
	8514/ULTRA + VGA	$1099/$1299	512K/1MB	256	16	16/256
COMPAQ COMPUTER	Advanced Graphics 1024	$1299/$1638	512K/1MB	256	0	16/256
DESKTOP COMPUTING	AGA 1024	$1095	1MB	256	256	256
HERCULES COMPUTER	Hercules Graphics Station	$1024	1MB	256[3]	256	256
HEWLETT-PACKARD	IGC 10	$995	512K	16	16	0
IBM	8514/A	$1290	512K/1MB	0	0	16/256
MATROX	MG-104	$1395	512K	16	0	16
	MG-108	$1695	1MB	16	0	256
	PG-1024	$1995/$2595	512K/1MB	0	0	0
NEC TECHNOLOGIES	MultiSync Graphics Engine	$999/$1499	512K/1MB	16/256	16/256	16/256
NUMBER NINE COMPUTER	#9GX Levels 1, 2, 3	$895/$1195/$1495	512K/1MB/2MB	16/256/256	0	0
SOTA TECHNOLOGY	340i	$995/$1295	512K/1MB	256	16/256	16/256
VECTRIX	VX1024	$895/$1095	384K/768K	0	0	0
	EX1280	$1995/$2595	640K/1280K	16/256	16/256	16/256
VERMONT MICROSYSTEMS	Cobra Plus	$1495/$2695	384K/768K	16/256	16/256	16/256
WESTERN DIGITAL IMAGING	8514/A	$899/$1198	512K/1MB	0	0	16/256
	8514/A Camba	$1099/$1398	512K/1MB	16	16	16/256
ZYMOS	Rendition II	$1495/$2095	512K/1MB	16/256	16/256	16/256

[1] With optional module. [2] Uses DRAM. [3] Can display 32K colors at 640 × 480.

ware driver quality is almost as important as hardware reliability. Some drivers are better written than others, and the only way to find the best is to compare boards' speed and image quality on identical monitors.

Graphics Coprocessor Boards

Here's where the fast crowd lives, both in speed and in price. Take IBM's offering: Introduced three-and-a-half years ago, the IBM 8514/A was one of the first beyond-VGA boards intended to make 1024 by 768 a mainstream phenomenon. Prices have dropped considerably since then, but the 8514/A still costs $1290, and the 16-inch, interlaced 8514 monitor paired with it goes for $1665.

The competition is divided into two camps. One group of manufacturers has cloned IBM's 8514/A board; the other group uses Texas Instruments' 34010 coprocessor. Though the 8514/A-compatible boards tend to be less expensive than the 34010 boards, pricing is spread all over the map. Maximum resolution and colors, along with the ability to emulate VGA, have the biggest effect on price.

COMPATIBILITY Obviously, to run VGA software, you need VGA capability. Most graphics coprocessor boards have optional VGA modules or provide VGA pass-through, a feature that enables you to use the VGA you already have. Coprocessor boards generally provide a greater selection of drivers than do super-VGA boards, but most of them are for desktop publishing and CAD applications.

Of course, if you plan to use *Windows* exclusively, you don't need VGA capability. All you need is *Windows* compatibility, which all these boards have. Step outside *Windows*, and you'll find that more business software supports the 8514/A than the 34010.

As with super-VGA boards, make sure you try out the graphics coprocessor board with the monitor you'll be using. Note that all the graphics coprocessor boards listed drive noninterlaced monitors running at 1024 by 768, but that a few won't interlace at that resolution.

PERFORMANCE Some graphics-intensive applications will run up to 25 times faster on a graphics coprocessor board than on a VGA. The 8514/A and 34010 camps continually tout benchmarks claiming one type is faster than the other, but seeing is believing. Ask for a demo running your primary application before you buy. In some applications, the speed advantage of a graphics coprocessor board over a fast super-VGA board may be too little to justify the higher price.

VIDEO MEMORY Nearly all the boards listed use VRAM, which makes memory upgrades more expensive than with super-VGA boards. Fortunately, all but two come with enough VRAM to do 1024 by 768 at 16 colors.

Even though graphics coprocessor boards have enough memory, only about half of them run at 800 by 600 resolution. If you're considering a board with 1024 by 768 capability, you'll have to get a monitor to match (read: expensive).

INSTALLATION There's

Non-interlaced 1024x768	Processor type	VGA pass-through	VGA capability	Warranty (years)	Reader service number
16/256	34010	Y	1	5	825
0	8514/A	Y	N	2	826
16/256	8514/A	N	Y	2	826
0	8514/A	Y	N	2	826
16/256	8514/A	N	Y	2	826
16/256	34010	Y	N	1	827
256	34010	Y	N	1	828
256	34010	N	Y	2	829
16	34010	Y	N	1	830
0	8514/A	N	N	1	831
16	8514/A	Y	1	1	832
256	8514/A	Y	1	1	832
16/256	34010	Y	N	1	832
16/256	34010	Y	Y	1	833
16/256/256	34010	Y	1	2	834
16/256	34010	Y	Y	5	835
16/256	34010	Y	N	1	836
16/256	34010	Y	Y	1	836
16/256	34010	Y	1	5	837
16/256	8514/A	Y	N	3	838
16/256	8514/A	Y	Y	3	838
16/256	34010	Y	1	1	839

For more information about all products in this table, circle reader service no. 907.

no doubt the 8514/A crowd has an advantage here: *Windows* comes with an 8514/A driver. During setup, you simply pick *8514/A* from *Windows'* list of displays, and you're ready to roll at 1024 by 768. With 34010 boards you must copy a driver from disk, the same as with a super-VGA board.

Graphics coprocessor boards, like super-VGAs, come with a bundle of utilities for turning special features on and off. A number of them also come with special software to enhance performance with certain applications (*Windows* and *AutoCAD* are the most common), and installing the program may require a separate routine.

QUALITY As with any hardware, the longer the warranty on the board, the better. Remember, too, to try it out with your chosen application before you buy to ensure that driver quality is up to snuff.

Multiscan Monitors

If you've ever seen the sorry results of hooking the wrong board to the right monitor, you'll appreciate the multiscan concept. Designed to sync up intelligently with signals from multiple graphics boards, the typical multiscan can adapt capably to both VGA and beyond-VGA resolutions.

Most multiscans can display a virtually unlimited number of resolutions within a certain range, but a new crop of entries has narrowed the choice to the two or three key resolutions—a clever cost-saving measure. Three other factors that commonly affect cost are dot pitch, scanning technique at 1024 by 768, and the ability to accept digital input (for example, from an EGA or CGA board).

DOT PITCH Next to resolution, dot pitch is the most important factor in determining the apparent sharpness of an image. Dot pitch is the distance between the tiny phosphor dots on the screen's inner surface. All other things being equal, the smaller the dot pitch, the sharper the image.

The most common dot pitches are .31mm and .28mm. On a 14-inch monitor, a .31mm dot pitch is adequate for 800 by 600 resolution, but if you want to up the ante to 1024 by 768, you need to have .28mm dot pitch or better. On a 16-inch monitor running in 1024 by 768 mode, greater screen area renders .31mm dot pitch acceptable.

COMPATIBILITY Though you may plan to use a monitor at beyond-VGA resolution, some users also need the ability to mix and match boards and monitors at will. A number of the higher-priced monitors handle digital input, which means they work with VGA, EGA, CGA, IBM Monochrome, and—usually—Hercules Graphics boards.

All the multiscans listed run at VGA resolution, but three of the 16-inch units won't do 800 by 600, and four inexpensive 14-inch units lack 1024 by 768 capability. Even if both the board and monitor can display graphics at the same beyond-VGA resolutions, remember that certain pairings may produce inferior images, so try before you buy.

SCANNING MODE The flicker caused by interlaced scanning bothers some people more than it does others. Most experienced users agree, however, that the longer you use an interlacing monitor, the more eye fatigue you'll experience. At 640 by 480 or 800 by 600, all the multiscans listed use noninterlaced scanning, but the vast majority of 14-inch multiscans fall back to interlaced scanning at 1024 by 768.

Unless you like squinting at small fonts, you should probably buy a 16-inch monitor if you need to work at that resolution fairly often. If you're willing to pony up for a monitor that size, pay the extra $100 to $200 for one that supports noninterlaced scanning and treat yourself to a flicker-free environment.

QUALITY You should always select a monitor by comparing the top contenders with your own eyes—side by side, if possible. Try switching between VGA and beyond-VGA modes. Some monitors will adjust automatically, while others will require manual adjustment to get the picture size right. Some won't align properly at all, indicating either a bad match between board and monitor or a defective unit.

Once, we thought OS/2 and Presentation Manager would lead us into a computing environment simpler, more productive, and more enjoyable than before. *Windows 3.0* has taken that role instead, and graphics hardware vendors are anxious to support it.

In this guide we've made every effort to provide you with cost-effective hardware solutions tailored to specific applications. But if you're committed to *Windows*, you may want to take a leap ahead. The near future of graphics lies with the big screen, at flicker-free resolutions of 1024 by 768 or sharper. Sure, a 16-inch monitor will cost less a year from now. But the better the hardware platform, the sooner you and your employees will enjoy the full benefit of the new environment.

TJ Byers is a contributing editor and Eric Knorr the editor for PC World.

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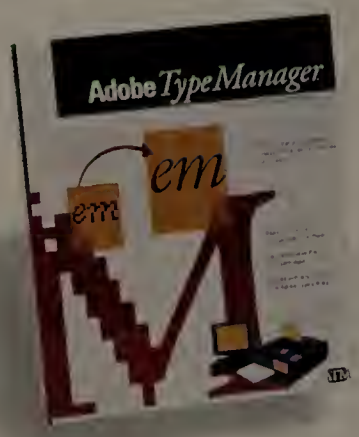

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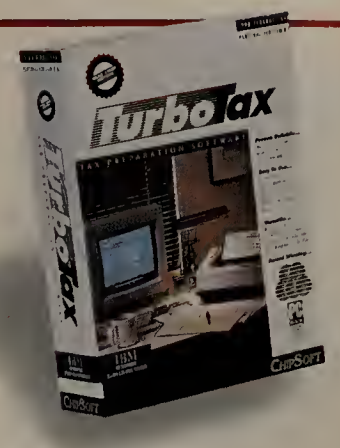

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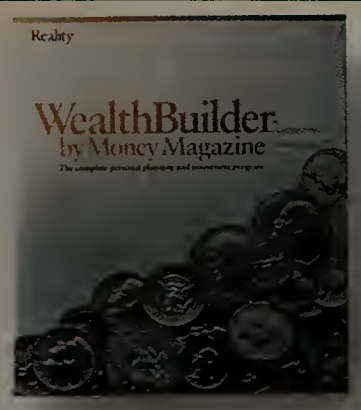

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7513 ▣Professional File Network 2.0... 379.
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4342 ▣First Graphics 1.0..... 99.
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6889 ▣MicroPhone II for Windows..... 215.
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7977 ▣Brief 3.0 *(Programmer's Editor)* . 155.
Spinnaker ... NCP
7604 ▣PLUS for Windows 1.0..... 289.
4441 □Resume Kit 1.32..... 25.
4446 □Eight In One 2.0..... 39.
Systat ... NCP
7415 ▣Systat/SyGraph 5.0..... 649.
Symantec ... NCP
3152 ▣Norton Commander 3.0..... 105.
6397 ▣The Norton Backup 1.1..... 105.
3146 ▣The Norton Utilities 5.0..... 125.
3425 □Q&A 3.0..... 229.
3431 □Timeline 4.0..... 469.
Systems Compatibility ... NCP
6564 □Software Bridge 4.1..... 79.
6570 □Software Bridge LAN 4.1..... 155.
TIMESLIPS ... NCP
2987 □Timeslips III 4.0..... 195.
4277 □Timeslips III Network..... 399.
6994 □PercentEdge 1.0..... 69.
Timeworks ... NCP
6253 ▣Publish-It! 1.1..... 115.
Touchstone Software ... NCP
7420 ▣Check It 3.0..... 89.
Traveling Software ... NCP
5179 ▣LapLink III 3.0..... 95.
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3561 ▣True BASIC 2.1..... 52.
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7575 ▣ValuePak *(includes 4 programs)*.. 69.
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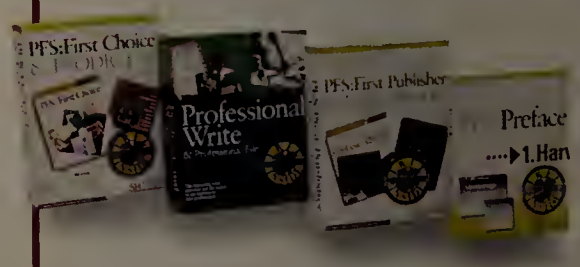
7781 ▣LetterPerfect 1.0..... 135.
3804 □WordPerfect 5.1..... 265.
6685 ▣DrawPerfect 1.1..... 279.
WordStar International ... NCP
6791 □WordStar Prof. 6.0..... 279.
7605 □WordStar 6.0 Network..... 345.
Xerox ... NCP
7796 ▣Ventura Publisher for Windows 3.0 569.
XTREE ... NCP
6161 ▣XTreePro Gold 1.4..... 85.
ZSoft ... NCP
7016 ▣PC Paintbrush IV Plus 1.0..... 119.
7014 ▣PC Paintbrush Plus for Windows 1.12 89.



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6881 ☐Populous. . . . . 39.
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5803 ☐Their Finest Hour *(Battle of Britain)* 42.
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7881 ☐Entertainment Pk for Windows 1.0 29.
2858 ☐Flight Simulator 4.0 . . . . . 39.
Microsoft Press (Books)
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8126 Running with DOS 4th Edition. . . . . 20.
8129 Running Windows *(2nd Edition)* . . . 22.
8136 Running Microsoft Excel . . . . . 22.
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True BASIC, Inc. ... NCP
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8041 SixPak 286 0k. . . . . 105.
4107 RAMpage Plus 286 512k. . . . . 419.
4105 RAMpage Plus MC 512k . . . . . 419.
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7061 BOCARAM/XT 0K *(0-2 Meg, LIM 4.0)* 99.
7135 TophAT *(16-bit backfill 512K to 640K)* 99.
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6999 I/O Board for Microchannel S/S/P . 109.
6995 SuperVGA *(800 x 600, 16/8 bit)* . . . 115.
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5119 2400 Baud External Modem . . . . . 179.
6420 2400EX MNP Modem. . . . . 229.
7880 9600EX Modem . . . . . 549.
2346 Inboard 386/PC w/1 Meg *(w/free Ami)* 519.
2348 Inboard 386/PC w/1 Meg Piggyback 349.
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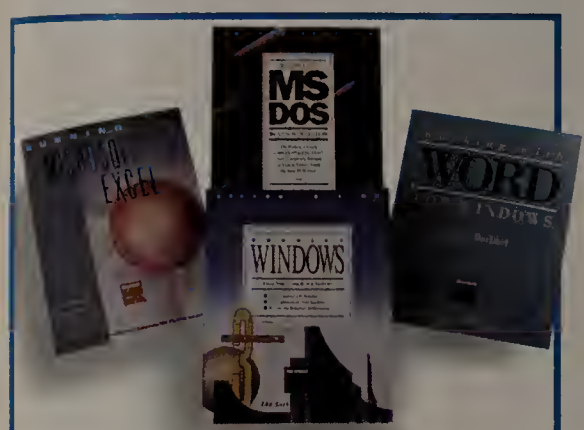

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5500	80-152M Int. Tape Drive	629.
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7099	ST251-1 PC/XT *(w/controller)*	329.
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7155	ST138R-1 Model 30 *(w/controller)*	359.
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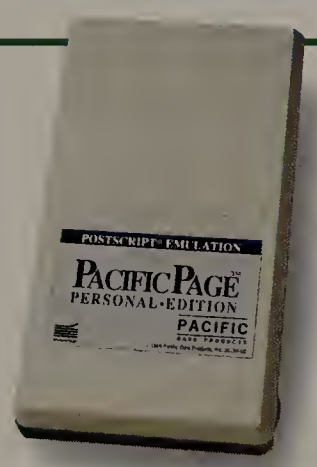
Intel ... 5 years
7782 *SatisFAXtion*–Send and receive faxes from within most applications using the print command. Built-in 2400 bps MNP modem standard. Includes coupons for free PC Tools and Fax-It software . . . . . $399.



Pacific Data Products ... lifetime
7158 *PacificPage Personal Edition 4.0*–New and improved PostScript emulation for your HP LaserJet IIP, IID or III. Faster, superb font quality. Minimum 1.5M printer memory required . . . . . $379.

DISKS

Maxell ... lifetime

2789	5¼" MD2-D 360k Disks *(Qty. 10)*	12.
2790	5¼" MD2-HD 1.2Mb Disks *(Qty. 10)*	19.
2792	3½" DS/DD 720k Diskettes *(Qty. 10)*	14.
2793	3½" DS/HD 1.44Mb Diskettes *(Qty. 10)*	27.

Sony ... lifetime

3291	5¼" DS/DD 360k Disks *(Qty. 10)*	10.
3292	5¼" DS/HD 1.2Mb Disks *(Qty. 10)*	19.
3297	3½" DS/DD 720k Diskettes *(Qty. 10)*	13.
3298	3½" DS/HD 1.44Mb Diskettes *(Qty. 10)*	22.
6659	QD 2000 Tape Cartridge	19.

MEMORY

6556	256k DRAMs *(100 ns, set of 9)*	29.
5510	1 Meg x 9 SIMMs *(80 nanosecond)*	79.
5746	1 Meg Chips *(80 ns, set of 9)*	69.

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- We accept VISA and MASTERCARD only.
- No surcharge added for credit card orders.
- Your card is not charged until we ship.
- If we must ship a partial order, we never charge freight on the shipment(s) that complete the order (in the U.S.).
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- All U.S. shipments insured; no additional charge.
- APO/FPO orders shipped 1st Class Mail.
- International orders U.S. $250 minimum.
- Upon receipt and approval, personal and company checks clear the same day for immediate shipment of your order.
- COD max. $1000. Cash, cashier's check, or money order.
- 120 day limited warranty on all products.*
- To order, call us Monday through Friday 8:00 AM to 1:00 AM, or Saturday 9:00 AM to 5:30 PM. You can call our business offices at 603/446-3383 Monday through Friday 9:00 AM to 5:30 PM.

Reflection Technology ... 1 year
7127 *Private Eye*–A large screen in a small box. A tiny virtual display which offers a full-size, 12" IBM CGA auxiliary screen to PCs & laptops. View privately in planes or meetings. Brighter than LCDs. . . . . $499.

SHIPPING

Note: Accounts on net terms pay actual shipping.

Continental US:
- For heavy hardware items such as printers, monitors, Bernoulli Boxes, etc. pay actual charges. Call for UPS 2nd-Day & Next-Day-Air.
- For all other items, add $3 per order to cover UPS Shipping. For such items, we automatically use Airborne Express at no extra charge if you are more than 2 days from us by UPS ground.

Hawaii:
- For monitors, printers, Bernoulli Boxes, computers, hard drives, and power backups, actual UPS Blue charge will be added. For all other items, add $3 per order.

Alaska and outside Continental US:
- Call 603/446-7721 for information.

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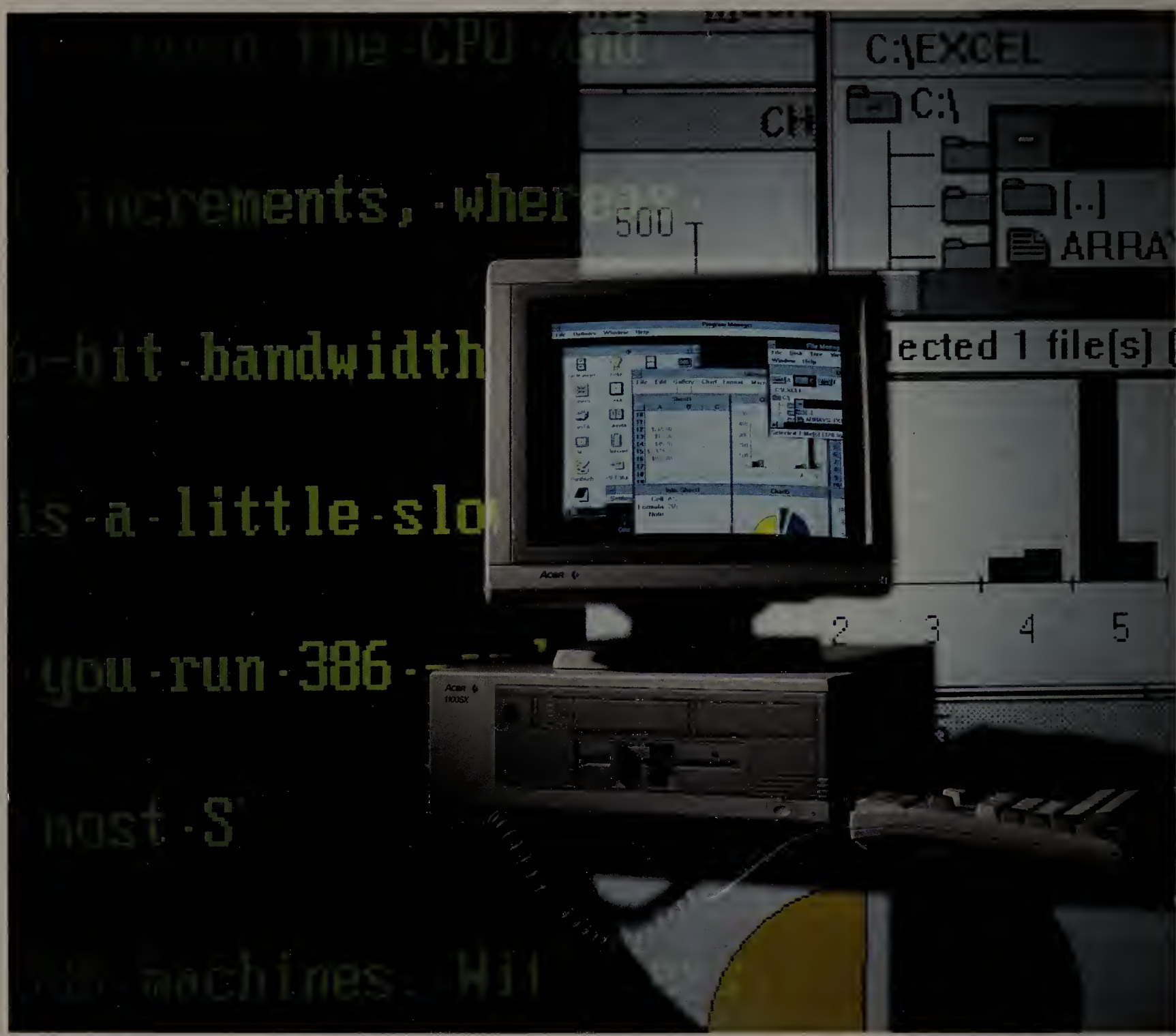

16-MHz SX Systems

ROBERT CARDIN

A 16-MHz SX is the ideal bridge between character-based and graphical worlds. We show you how to pick the winners from a collection of 85 SX mainstays.

Susan Lusty

Think of the 16-MHz SX machine as part of the furniture. It's inexpensive enough to put in every cubicle, and if you're determined to take advantage of the best software, its 386-compatible processor is as essential as a comfortable chair. A cheaper 286 system may leave you uncomfortable, without full support for critical applications.

Buying less computer than an SX makes little sense, but you may desire more—which means shelling out for a full-fledged 386 or a 486. The average 25-MHz 386, for example, delivers 61 to 65 percent faster processing speed than the average SX, while the price typically increases $2000 or $3000. Many businesses will want to pay this premium only for CAD, LAN server, desktop publishing, and other taxing applications.

A compact chassis and entry-level pricing position the 16-MHz SX as the preferred light-duty office workstation. In this guide, you'll find 85 such systems, with vital statistics and buying information on each. Before you browse through the tables, though, let's take a look at a few key buying issues.

Standard Features Consistent with the theme of this issue, we've put together a standard configuration that makes sense for running *Windows*. The prices listed in the table are based on one parallel and one serial port, a floppy drive (with your choice of 3½- or 5¼-inch formats), a floppy/hard drive controller, an 80MB to 110MB hard disk, 4MB of memory on the motherboard, a VGA controller and color monitor, a keyboard, and DOS 3.3 or a later version. Systems sold through dealers will probably cost 20 to 30 percent less than the list price. If you want a monochrome monitor instead, you can slice about $300 to $400 off the price.

To speed throughput, most of these systems offer disk and memory caching. Disk caching keeps frequently used data in RAM to eliminate redundant disk accesses. Memory caching works similarly except that it keeps frequently used data in special high-speed static memory. Disk caching requires a software utility, while memory caching is built into the system hardware. If the system you choose doesn't include disk caching, you can buy a third-party utility for about $70. Also, to speed calculations, all the SXs listed offer an optional 387SX math coprocessor.

CPU-Speed Memory All of the systems let you expand CPU-speed memory up to 2MB, on the motherboard or via a special high-speed slot. Most allow 8MB, and some as much as 16MB of high-speed RAM. (You can always expand SXs to 16MB by placing memory boards in standard 8-MHz expansion slots, but this eats up precious slots, and the expansion RAM runs slower.) Headroom for at least 8MB is a good idea for *Windows*, especially with today's cheap RAM prices.

Expandability Most SXs have fewer slots available for expansion boards than standard 386s do. Even so, maximum flexibility demands at least four free slots after the unit is equipped in the standard configuration given above. Most of these should be 8/16-bit slots: Some boards, such as VGA adapters, can take advantage of 16-bit throughput.

Device Capacity An SX should have at least three drive bays, two of them externally accessible, so you can have a floppy drive, a hard drive, and a tape drive. Most 3½-inch drives will fit into a third-height bay, most 5¼-inch drives require a half-height bay, and many hard disks over 120MB typically need full-height bays.

Programs are hogging more and more disk megabytes these days: Together, *Windows 3.0*, a word processor, a desktop publishing package, and a spreadsheet can easily consume 25MB of hard disk space—not counting data files. Consequently, unless you can store files or share programs on a network, you'll probably need an 80MB hard disk—with 120MB an even safer choice.

Design and Construction Most of the machines reviewed have small footprints (16 by 16 inches), which can pay off on crowded desktops. However, some companies have resorted to tangled internal system designs in order to slim down, so make sure you can open the system unit easily to install boards and other add-ons. For example, some

16-MHz 386SX SYSTEMS

	STANDARD FEATURES											
	List price[1]	Disk coching softwore	Memory coching	Parallel ports (on matherbaard*)	Seriol ports	Dedi-coted mouse port	Built-in flappy con-traller	Built-in hard disk con-troller	Built-in VGA con-troller	CPU-speed RAM (MB)	8/16-bit slats: tatal/	8-bit-slots: tatal/ free
ACER 1100SX	$4120	y	n	1*	2*	y	y	y	y	8	4/4	0
ACMA 386SX	$2195	n	n	1	2	n	n	n	n	8	6/4	2/1
ADVANCED DIGITAL CORP. POWERLITE 386SX	$3772[3]	y	y	1*	1*	y	n	n	y	5	4/2	0
AMAX 386SX-16	$2085	y	n	1*	2*	n	y	y	n	8	6/5	1/1
AMERICAN MITAC MPC 2386	$3505	n	n	1*	2*	y	y	n	y	16/8	5/4	1/1
AMERICAN MITAC MPS 2386	$3620	n	n	1*	1*	y	y	n	y	16/8	6/5	0
ARCHE RIVAL 386SX	$4260	n	n	1	2	n	y[4]	y	n	16/8	6/6	2/0
ARCHE TRIUMPH 386SX	$4160	n	n	1*	2	n	y	y	y	16/8	3/3	2/1
AST PREMIUM/386SX-16	$4895	y	y	1*	2*	y	y	y	n	2	6/5	1/1
AT&T 6386SX/EL	$5900	y	y	1*	2*	y	y	y	y	8	3/3	1/1
AUSTIN 386SX WINSTATION	$2658	n	n	1*	2*	n	y	y	n	8	6/5	1/1
CAF MASTER 386SX-16	$2370	n	n	0	0	n	n	n	n	8	6/4	2/1
CLONE 386SX	$2398	y	y	1	2	n	n	n	n	8	6/4	2/1
CLUB AMERICAN CV-316SX-B	$2440	n	n	1	1	n	n	n	n	8	6/4	2/1
COMPAQ DESKPRO/386s	$5197	y	y	1*	2*	y	y	y	y	13	4/4	0/0
COMPUADD 316s	$2708	n	n	1*	2*	n	y	y	n	4	3/2	2
CORDATA CPC-8100	$2547	n	n	1*	2*	n	y	y	y	8	6/6	2/2
CPT MODEL 316-SX	$2399	n	n	1	2	n	n	n	n	5	5/4	3/2
CSR 386SX-16	$3499	n	n	1	1	y	n	n	n	8	5/3	3/2
CSS LABS. PREFERRED 386SX	$3747	n	n	0	0	n	n	n	n	8	8/5	0
DATA GENERAL DASHER/386-16C	$4835	n	n	1*	2*	n	y	y	y	8	4/2	0
DELL SYSTEM 316SX	$2699	n	n	1*	2*	n	y	y	y	8	3/3	0
DFI 386SX	$4495	n	n	1	2	n	n	n	n	8	6/4	1/1
EASYDATA 386SX	$2499	y	n	1*	2*	n	y	y	n	8	5/4	2/2
ELTECH 2160	$2579	n	n	1	2	n	n	n	n	8	5/3	3/2
EPSON EQUITY 386SX PLUS	$5270	n	n	1*	1*	y	y	y	y	14	3/3	1/1
EVEREX STEP 386is	$4096	y	n	1	1	n	n	n	n	4	6/4	2/1
EVEREX TEMPO 386SX	$4188	n	n	1	2	n	n	n	n	8	6/4	2/1
FALCO 386SX	$3985	n	n	1*	2*	n	y	y	y	8	2/2	0
FIVESTAR MODEL 386SX	$2495	y	y	1*	2*	n	y	y	y	8	4/4	0
FORTRON/SOURCE NET-SET SX	$2400	y	n	1*	1*	y	y	y	n	8	3/2	0
GATEWAY 386SX	$2245	n	n	1*	2*	y	y	y	n	8	6/4	2/2
GRID 386SX-MFP	$4299	n	n	1*	1*	y	y	y	y	4	3/3	0
GRID 386isx	$4599	n	n	1*	1*	n	y	y	y	16	6/6	0
HCI MAXAR 386SXL	$3499	n	n	1*	2*	y	y	y	y	8	4/3	0
HERTZ 386SXe	$2575	y	y	1	1	n	n	n	n	5	6/4	2/1
HEWLETT-PACKARD QS/16S	$6082	y	n	1	1	y	n	n	n	8	6/4	1/1
HIQUALITY 386SX-16	$2385	n	n	1	2	n	n	n	n	8	6/2	2/1
HYUNDAI SUPER-386	$4285	n	n	1	1	n	y	y	n	8	4/3	2/2
IBM PS/2 MODEL 55 SX	$6405[7]	y	n	1*	1*	y	y	n	y	4	3/3	0
INSIGHT 386SX-16	$2049	n	n	1	2	n	n	n	n	8	6/4	2/1
LASER 386SX	$3000	y	n	1*	2*	n	y	y	n	4	4/3	0

[1] Except os noted, price bosed on 4MB RAM, 1.2MB or1.44MB floppy drive, 80MB to 110MB hord disk, one porallel ond one seriol port, VGA controller ond color monitor, 101-key keyboord, ond DOS 3.3 or loter version.

[2] One yeor ports, two years lobor.

			DESIGN				SERVICE AND SUPPORT							
Max. number of third-/half-/full-height drives	Externally accessible drives	Longest hard disk sold with machine	Switchless setup	Compact footprint	Front-panel on/off switch	Front-panel reset button	Warranty period (months)	Free on-site service (months)	Toll-free support number	Daily support hours	Weekend support	Electronic bulletin board	Fax	Reader service number
0/2/0	2	100MB	y	y	y	y	12	4	dealer	dealer	dealer	n	y	640
1/4/0	3	676MB	y	y	n	y	[2]	n	y	11	n	n	y	641
2/0/0	1	100MB	y	y	n	y	12	n	y	9	n	y	y	642
0/4/0	4	700MB	y	y	y	y	12	n	y	8.5	n	n	y	643
2/2/0	3	200MB	y	y	y	y	12	12	y	9	n	y	y	683
2/2/0	3	60MB	y	y	y	y	12	12	y	9	n	y	y	683
0/3/0	2	380MB	y	y	n	y	24	n	y	10	n	n	y	644
0/2/2	4	380MB	y	y	n	y	24	n	y	10	n	n	y	644
0/5/0	3	320MB	y	n	n	y	12	n	y	11	n	y	y	646
1/2/0	3	80MB	y	n	y	y	12	n	y	9	n	y	y	647
0/4/0	3	175MB	y	y	n	y	12	12	y	13	y	n	y	648
1/3/0	1	200MB	y	n	y	y	12	n	y	9	n	n	y	650
0/4/0	4	220MB	y	n[5]	y	y	12	n	n	24	y	n	dealer	651
0/4/0	3	650MB	y	y	n	y	12	n	n	10	n	n	y	652
2/2/0	4	320MB	n	y	y	n	12	dealer	dealer	dealer	n	n	n	653
0/3/0	2	110MB	y	y	y	n	12	n	y	11	n	n	y	654
0/4/0	3	40MB	y	y	n	y	12	n	y	9	n	n	y	655
1/3/0	4	640MB	n	y	n	y	12	n	y	12	n	n	y	656
0/5/0	3	1.2GB	n	y	y	y	24	12	y	10	n	n	y	657
0/4/0	3	766MB	y	n	n	y	12	n	n	13	n	y	n	659
0/4/0	2	200MB	y	y	n	y	12	12	y	9	n	y	n	660
3/0/0	2	190MB	y	y	y	n	12	12	y	12	y	y	y	661
1/3/1	4	330MB	y	y	y	y	12	12	n	9	n	n	y	662
2/3/0	4	600MB	y	y	y	n	12	12	dealer	dealer	dealer	n	n	663
0/5/0	5	670MB	y	y	n	y	12	12	y	12	n	n	y	664
0/3/0	2	100MB	y	y	y	y	12	dealer	n	dealer	dealer	n	n	665
0/3/0 or 0/5/0	3 or 5	660MB	y	y	n	y	12	12	dealer	dealer	dealer	y	n	666
0/3/0 or 0/5/0	3 or 5	660MB	y	y	n	y	12	3	dealer	dealer	dealer	y	n	666
0/3/0	1	200MB	y	y	y	n	12	3	y	11	n	n	y	667
2/3/0	4	1.2GB	y	n[5]	y	y	12	12	y	10	n	y	y	668
3/3/1	2	300MB	y	y	y	y	12	12	y	9.5	n	n	y	669
0/5/0	3	650MB	y	y	n	y	12	12	y	14	y	y	y	670
1/1/0	2	440MB	n	y	y	y	12	n	y	11	n	n	y	671
0/3/0	3	1GB	n	y	y	y	12	n	y	11	n	n	y	671
0/3/0	2	120MB	y	y	y	y	12	12	y	9	n	n	y	672
0/5/0	5	383MB	n	y	n	y	12	n	y	8	n	n	y	673
0/3/0	2	168MB	y	y	y	n	12	3	y	24[6]	y	y	n	674
0/5/0	3	350MB	y	n	y	y	12	n	y	10	y	y	y	675
1/2/0	2	100MB	y	y	y	y	18	n	dealer	dealer	dealer	dealer	dealer	676
0/2/0	2	60MB	y	y	y	n	12	dealer	dealer	dealer	n	n	n	677
1/3/0	3	1GB	y	y	y	y	12	12	y	13	y	n	y	678
0/3/0	2	80MB	y	y	n	y	12	6	y	10	n	y	y	679

[2] Does not include monitor or DOS. [4] $100 extra for built-in floppy controller. [5] Case is a minitower. [6] 24-hour voice mail or pager to leave queries.

16-MHz 386SX SYSTEMS

	STANDARD FEATURES											
	List price[1]	Disk caching software	Memory caching	Parallel ports (on motherboard*)	Serial ports	Dedicated mouse port	Built-in floppy controller	Built-in hard disk controller	Built-in VGA controller	CPU-speed RAM (MB)	8/16-bit slots: total/	8-bit-slots: total/ free
MICRO EXPRESS ME 386SX	$2374	n	n	1	1	n	n	n	n	8	6/4	2/2
MICRO EXPRESS ME 386SX/SL	$2324	n	n	1*	1*	n	y	y	y	4	3/3	2/2
MIS 386SX-16	$1950	n	n	1	2	y	n	n	n	8	6/4	2/1
MISSION CYRUS DARIUS PROFESSIONAL	$4120	y	y	1*	1*	y	y	y	y	8	2/2	0
MITSUBA MINI 386SX	$2895	n	n	1	2	n	n	n	n	5	6/4	2/2
MITSUBISHI MP 386S	$3695	y	n	1*	2*	n	y	n	n	8	6/4	0
MULTIMICRO 386SX-16	$2750	n	n	1	1	n	n	n	n	8	5/3	3/2
NCR ELPCS386SX	$5714	y	n	1*	2*	y	y	y	y	5	2/2	0
NCR PC386SX	$5914	y	n	1*	2*	y	y	y	y	2	4/4	0
NEC POWERMATE SX PLUS	$6068	y	n	1	1	y	y	n	y	10	5/4	0
NETWORK CONNECTION TRIUMPH SX	$1695	n	n	1	2	n	n	n	n	8	6/3	2/2
OLIVETTI PCS 386SX	$4790	n	n	1*	1*	y	y	y	y	8	3/3	1/1
OSICOM EXECUTIVE 386SX	$3489	n	n	1*	2*	n	y	y	n	8	3/2	2/2
PACKARD BELL FORCE 386X	$2599	n	n	1*	2*	y	y	y	n	8	3/2	1/1
PAN OVERSEAS POC 386SX	$3747	n	n	1*	2*	n	y	y	n	5	5/4	1/1
PC BRAND 386SX-16	$2186	y	n	1	2	n	n	n	n	8	6/4	2/1
PC CRAFT PCC 2700/16	$3299	n	n	1	2	n	n	y	n	4	6/4	2/1
PC DESIGNS GV-386/SX	$2998	y	y	1	2	n	n	n	n	4	3/2	2/1
PHILIPS MAGNAVOX MAXSTATION 386SX	$2399	n	n	1*	2*	n	y	y	n	8	4/3	1/1
POLYWELL 386SX-16VB	$2449	n	n	1	2	n	n	n	n	8	5/3	2/2
PROTEUS MODEL 386SX-16	$2359	y	n	1*	2*	y	y	y	n	8	6/5	1/1
REPLY 386SX-16	$5645	n	n	2*	2*	y	y	y	y	8	5/5	0
SAMSUNG SD 700	$4200	y	n	1*	2*	y	y	y	n	8	5/4	0
SUN MOON STAR 386SX	$2395	y	n	1	2	n	y	y	n	8	3/2	2/2
SYNTREX 386SX-16	$3395	n	n	1*	2*	n	y	y	n	8	2/1	4/4
TANDON SLIMLINE 386SX	$3363	n	n	1*	2*	n	y	y	n	5	3/2	1/1
TANDY 4016 SX	$4498	n	n	1*	1*	y	y	y	y	4	3/3	0
TANGENT 386SX-16	$2195	n	n	0	0	n	n	n	n	8	5/3	2/2
TATUNG TCS8450S	$2425	n	n	1*	2*	y	y	y	n	8	3/2	1/1
TELEVIDEO TELESX	$3395	n	n	1*	2*	n	y	y	y	4	5/5	0
TENEX 386SX	$2247	y	n	1	2	n	n	n	n	5	6/4	2/2
TEXAS INSTRUMENTS TI 386SX	$6475	y	n	1*	1*	y	y	y	n	4	3/2	1/1
TOPLINE 386SX	$2595	n	n	1	2	y	y	y	n	8	5/4	2/0
TUSSEY SWAN 386SX	$2693	y	y	1*	2*	n	y	y	n	8	6/5	1/1
TWINHEAD SUPERSET 590-16	$2839	y	n	1*	2*	n	y	y	y	5	4/4	0
ULTRA COMP 386SX	$2395	y	n	1	2	n	n	y	n	8	5/3	3/2
UNISYS 500/16A	$5109	y	n	1*	2*	n	y	n	n	8	4/3	1/1
USIT ATHENA 386SX-16	$3150	y	n	1*	2*	y	y	y	y	4	3/3	0
WANG PC 350/16S	$5635	n	n	1	2	n	y	y	n	8	4/4	2/1
WLT AT-316S-6/8	$3143	n	n	1*	2*	n	y	y	n	8	5/4 or 7/6	1/1
WYSE WY-3016SX	$4704	y	n	1	1	n	y	y	n	8	6/5	2/2
WYSE WY-3116SX	$4704	y	n	1	2	n	y	y	n	12	4/3	2/2
ZENITH Z-386SX	$5898	y	y	1*	2*	n	y	y	n	8	5/4	0

[7] 60MB hard disk. [8] Prorated warranty. [9] Businesses only. [10] In-house labor 60 months, motherboard 24 months, VGA card 48 months, standard parts 12 months.

			DESIGN				SERVICE AND SUPPORT							
Max. number of third-/half-/full-height drives	Externally accessible drives	Largest hard disk sold with machine	Switchless setup	Compact footprint	Front-panel on/off switch	Front-panel reset button	Warranty period (months)	Free on-site service (months)	Toll-free support number	Daily support hours	Weekend support	Electronic bulletin board	Fax	Reader service number
0/5/0	3	750MB	y	y	y	y	15	n	y	10	n	n	n	680
0/3/0	2	200MB	y	y	y	y	15	n	y	10	n	n	n	680
0/5/0	3	1.2GB	y	y	y	y	12	n	y	9.5	y	n	y	681
0/3/0	1	200MB	y	n	n	y	12	n	n	n/a	n/a	n	y	682
0/3/1	3	330MB	n	y	n	y	12	n	dealer	dealer	dealer	dealer	y	684
1/2/0	2	100MB	n	y	y	y	12	dealer	y	10	n	y	y	685
0/4/0	4	677MB	y	y	y	y	12	12	n	9	n	y	y	686
0/2/0	1	100MB	y	y	y	n	12	12	dealer	dealer	dealer	n	n	687
0/3/0	2	100MB	y	y	y	n	12	12	dealer	dealer	dealer	n	n	687
0/3/0	2	140MB	n	y	y	n	12	dealer	dealer	dealer	dealer	y	y	688
1/1/1	3	1.2GB	y	y	n	y	12	n	dealer	12.5[6]	y[6]	dealer	y	689
2/0/0	2	100MB	y	y	n	n	12	12	y	9.5	n	n	n	690
1/2/0	2	140MB	y	y	y	y	12	12	y	12	n	y	y	691
0/4/0	3	124MB	y	y	y	y	12	12	y	9	y	n	y	692
0/5/0	3	600MB	y	y	n	y	12	n	dealer	dealer	dealer	n	y	693
6/4/2	4	640MB	y	y	y	y	60[8]	3	y	16	n	n	y	694
0/3/1	3	768MB	y	y	y	y	12	4	y	9	n	y	y	695
0/4/0	4	350MB	y	y	n	y	12	12[9]	y	11	y[6]	n	y	696
0/3/0	2	80MB	y	y	y	n	12	6	y	13	n	n	n	697
0/4/0	4	1GB	y	y	n	y	[10]	n	y	14	y	n	y	698
0/4/0	2	340MB	y	y	y	y	15	15	y	8	n	n	y	699
2/2/1	3	800MB	y	y	y	y	12	12	y	11	n	n	y	700
0	0	[11]	y	y	y	y	12	n	y	10	n	y	y	701
0/4/0	2	200MB	y	y	y	y	36	6	y	9	n	y	y	702
0/3/0	0	660MB	y	y	n	n	12	n	y	12	n	n	y	703
3/0/0	2	200MB	y	n	y	n	12	n	y	24	y	n	y	704
0/3/1	3	440MB	n	y	y	y	12	n	n	9.5	y	y	n	705
1/3/0	4	105MB	y	n	n	y	12	n	y	11	y	n	y	706
0/4/0	2	100MB	y	y	n	y	12	4	y	10	y	n	y	707
2/3/0	3	80MB	n	y	y	n	12	12	n	10	n	n	y	708
2/2/0	3	676MB	y	y	n	y	12	n	y	9	y	n	y	709
0/3/0	2	110MB	y	y	n	n	12	n	y	9	n	y	n	710
2/3/0	3	330MB	y	y	n	y	12	n	dealer	dealer	dealer	n	y	711
0/4/0	3	200MB	y	y	n	y	12	12	y	12	n	y	y	712
2/2/0	3	200MB	n	y	y	y	12	12	y	10	n	n	y	713
0/5/0 or 0/3/1	3	1.2GB	n	n	n	y	12	n	y[12]	9	n	n	y	714
0/3/0	1	320MB	y	y	y	y	12	n	y	24	y	y	n	715
1/1/1	2	300MB	y	y	y	y	24	n	y	10	n	n	n	716
0/3/0	2	200MB	n	y	y	n	12	n	y	19	n	n	y	717
0/3/0 or 0/5/0	2 or 3	321MB	y	y	n	y	36	36	y	12	n	n	y	718
0/4/0	3	110MB	y	y	y	y	12	n	y	10	n	y	y	719
0/3/0	3	110MB	y	y	n	y	12	n	y	10	n	y	y	719
2/1/0	2	80MB	y	y	y	n	12	dealer	dealer	dealer	dealer	dealer	dealer	720

[11] Company does not sell hard drives.

[12] Toll-free for out-of-state only.

For more information about all products in this table, circle reader service no. 902.

systems hide the coprocessor socket behind the power supply, forcing you to remove the motherboard.

Also look for niceties such as front-panel power and reset buttons. A switchless setup procedure that employs menu-driven software is far more convenient than flipping DIP switches. Keyboard style tends to be a matter of personal preference, so there's no substitute for a hands-on test drive.

Warranty and Technical Support When systems are similar in price and functionality, look to service and support as the tie breaker. All the vendors listed provide at least 12 months of warranty, but to play it safe you may want to choose one of the systems that

WHERE TO BUY

Acer America Corp.
401 Charcot Ave.
San Jose, CA 95131
800/538-1542,
800/782-1155 California, 408/922-0176 (fax)

ACMA Computers, Inc.
117 Fourier Ave.
Fremont, CA 94539
800/456-1818,
415/623-0818 (fax)

Advanced Digital Corp.
5432 Production Dr.
Huntington Beach, CA 92649
714/891-4004,
714/893-1546 (fax)

Amax Engineering Corp.
47315 Mission Falls Ct.
Fremont, CA 94539
800/888-2629,
415/651-3720 (fax)

America Mitac
410 E. Plumeria Dr.
San Jose, CA 95134
800/648-287 ext. 345, 408/432-0866 (fax)

Arche Technologies, Inc.
48881 Kato Rd.
Fremont, CA 94539
800/422-4674,
415/683-6754 (fax)

AST Research Inc.
16215 Alton Pkwy.
P.O. Box 19658
Irvine, CA 92713-9658
714/727-4141,
714/727-9357 (fax)

AT&T
One Speedwell Ave.
Morristown, NJ 07920
800/247-1212

Austin Computer Systems
10300 Metric Blvd.
Austin, TX 78758
800/752-1577,
512/454-1357 (fax)

CAF Technology, Inc.
600 S. Date Ave.
Alhambra, CA 91803
800/289-8299,
818/289-8752 (fax)

Clone Technologies, Inc.
1213 Bittersweet Rd.
Lake Ozark, MO 65049
314/365-2050,
314/365-2080 (fax)

Club American Technologies, Inc.
3401 W. Warren Ave.
Fremont, CA 94539
415/490-2201,
415/490-2687 (fax)

Compaq Computer Corp.
20555 State Hwy. 249
Houston, TX 77070
800/231-0900,
713/374-4583 (fax)

CompuAdd Corp.
12303 Technology Blvd.
Austin, TX 78727
800/627-1967,
512/250-5760 (fax)

Cordata Technologies, Inc.
1055 W. Victoria St.
Compton, CA 90220
213/603-2901,
213/763-0447 (fax)

CPT Corp.
8100 Mitchell Rd.
Eden Prairie, MN 55344-9833
612/937-8000,
612/937-1858 (fax)

CSR
200 Meadowlands Pkwy.
Secaucus, NJ 07094
800/366-1277,
201/617-1255 (fax)

CSS Laboratories, Inc.
1641 McGraw Ave.
Irvine, CA 92714
800/966-2771,
714/852-9464 (fax)

Data General Corp.
Marcom
3400 Computer Dr.
Westboro, MA 01580
508/898-4051,
508/898-2684 (fax)

Dell Computer Corp.
9505 Arboretum Blvd.
Austin, TX 78759-7299
800/426-5150

DFI
2544 Port St.
W. Sacramento, CA 95691
916/373-1234,
916/373-0221 (fax)

EasyData Computer Products
777 E. Middlefield Rd.
Mountain View, CA 94043
800/366-4560,
415/968-3400,
415/964-9747 (fax)

Eltech Research Inc.
47266 Benicia St.
Fremont, CA 94538
800/234-4331

Epson America, Inc.
20770 Madrona Ave.
Torrance, CA 90503
800/289-3776

Everex Systems, Inc.
48431 Milmont Dr.
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800/821-0806,
415/498-1111

Falco Data Products, Inc.
440 Potrero Ave.
Sunnyvale, CA 94086-4117
800/325-2648,
408/745-7860 (fax)

Fivestar Computers
2100 N. Greenville Ave.
Richardson, TX 75081
214/470-9000,
214/470-0191 (fax)

Fortron/Source
6818-G Patterson Pass Rd.
Livermore, CA 94550
800/821-9771,
415/373-1168 (fax)

Gateway 2000
610 Gateway Dr.
N. Sioux City, SD 57049
800/523-2000,
605/232-2023 (fax)

Grid Systems Corp.
47211 Lakeview Blvd.
Fremont, CA 94538
800/222-4743

Hertz Computer Corp.
325 Fifth Ave.
New York, NY 10016
800/232-8737,
212/684-3658 (fax)

Hewlett-Packard
Customer Information Center
19310 Pruneridge Ave.
Cupertino, CA 95014
880/752-0900

HiQuality Systems, Inc.
740 N. Mary Ave.
Sunnyvale, CA 94086
408/432-3300

Hyosung Computer & Information Systems (HCI)
710 Lakeway #285
Sunnyvale, CA 94085
408/733-0810,
408/733-2638 (fax)

Hyundai Electronics America
166 Baypointe Pkwy.
San Jose, CA 95134
408/473-9200

IBM
1133 Westchester Ave.
White Plains, NY 10604
800/426-2468

Insight Computers
1912 W. Fourth St.
Tempe, AZ 85281
800/776-7600,
602/350-1182 (fax)

Laser Computer, Inc.
800 N. Church St.
Lake Zurich, IL 60047-1596
708/540-8086,
708/540-8335 (fax)

Micro Express
1801 Carnegie Ave.
Santa Ana, CA 92705
714/852-1400,
714/852-1225 (fax)

offers two to five years. Make sure you read the fine print; most warranties cover parts and labor, but some cover only parts—a difference that could end up costing you hundreds of dollars.

Toll-free telephone tech support is another money saver, and some vendors also offer tech support via fax or modem. Watch out for 900 numbers, though; they can end up costing more than toll calls.

In today's SX market, selection is wider and prices are better than ever before. If you're looking for a low-cost ticket into the future, you're looking at an SX.

Susan Lusty is an assistant editor for PC World.

MIS Computer Systems
P.O. Box 70897
Sunnyvale, CA
94086-0897
800/733-9188,
408/730-5933 (fax)

Mission Cyrus Corp.
3700 Gilmore Way
Burnaby, BC
V5G 4M1 Canada
604/432-7727,
604/432-1130 (fax)

Mitsuba Corp.
650 Terrace Dr.
San Dimas, CA 91773
800/648-7822,
714/592-2866,
714/592-2179 (fax)

Mitsubishi Electronics America, Inc.
991 Knox St.
Torrance, CA 90502
213/515-3993

MultiMicro Inc.
582 Folsom St.
San Francisco, CA
94105
415/979-0140,
415/979-0142 (fax)

NCR Corp.
1700 S. Patterson Blvd.
Dayton, OH 45479
800/225-5627

NEC Technologies, Inc.
1414 Massachusetts
Ave.
Boxbarough, MA
01719
800/632-4636

The Network Connection
1324 Union Hill Rd.
Alpharetta, GA 30201
800/327-4853,
404/751-1884 (fax)

Olivetti Office USA
765 U.S. Hwy. 202
Somerville, NJ
08876-1289
201/526-8200,
201/526-8405 (fax)

Osicom Technologies
198 Green Pond Rd.
Rockaway, NJ 07866
201/586-2550,
201/586-9740 (fax)

Packard Bell Electronics
9425 Canoga Ave.
Chatsworth, CA 91311
818/773-4400

Pan Overseas Computer
44 Rte. 46 W
Pine Brook, NJ 07058
201/808-1900,
201/808-9889 (fax)

PC Brand Inc.
954 W. Washingtan St.
Chicago, IL 60607
800/722-7263,
312/633-2888 (fax)

PC Craft, Inc.
640 Puente St.
Brea, CA 92621
800/733-6666,
714/256-5025 (fax)

PC Designs
2504 N. Hemlock Cir.
Broken Arrow, OK
74012
800/324-5550,
918/251-7057 (fax)

Philips Consumer Electronics Co.
One Philips Dr.
P.O. Box 14810
Knoxville, TN
37914-1810
615/521-4499,
615/593-0065 (fax)

Polywell Computers
61-C Airport Blvd.
South San Francisco,
CA 94080
415/583-7222,
415/583-1974 (fax)

Proteus Technology Corp.
377 Rte. 17 S
Airport 17 Center
Hasbrouck Heights, NJ
07604
800/878-6427,
201/288-2245 (fax)

Reply Corp.
4435 Fortran Dr.
San Jose, CA 95134
800/955-5295,
408/942-4897 (fax)

Samsung Information Systems America
3655 N. First St.
San Jose, CA 95134
800/446-0262,
408/434-5653 (fax)

Sun Moon Star
1941 Ringwaad Ave.
San Jose, CA 95131
408/452-7811,
408/452-1411 (fax)

Swan Technologies
3075 Research Dr.
State College, PA
16801
800/468-9044,
814/237-5416 (fax)

Syntrex Inc.
246 Industrial Way W
Eatontown, NJ 07724
800/526-2829,
201/542-3957 (fax)

Tandon
405 Science Dr.
Maarpark, CA 93021
800/800-8850,
805/529-8408 (fax)

Tandy Corp.
1800 One Tandy
Center
Fort Worth, TX 76012
817/390-3300

Tangent Computers Inc.
197 Airport Blvd.
Burlingame, CA 94010
800/223-6677,
415/342-9380 (fax)

Tatung Company of America, Inc.
2850 El Presidio St.
Lang Beach, CA 90810
213/979-7055,
213/637-8484 (fax)

TeleVideo Systems, Inc.
550 E. Brokaw Rd.
P.O. Box 49048
San Jose, CA
95161-9048
408/954-8333,
408/954-0623 (fax)

Tenex Computer Express
56800 Magnetic Dr.
Mishawaka, IN
46545-7481
800/776-6781,
219/255-1778 (fax)

Texas Instruments Inc.
Information Technology Group
P.O. Box 202230,
ITG-004
Austin, TX
78720-2230
800/527-3500

Topline Technologies
310 E. Orangetharpe
Ave., Ste. J
Placentia, CA 92670
714/524-6900,
714/524-0125 (fax)

Twinhead Corp.
1537 Centre Pointe Dr.
Milpitas, CA 95035
408/945-0808,
408/945-1080 (fax)

Ultra-Comp
11988 Darsett Rd.
Maryland Heights, MI
63043
314/991-1988,
314/991-0437 (fax)

Unisys Corp.
P.O. Box 500
Blue Bell, PA 19424
215/986-3501

US Integrated Technologies (USIT)
3023 Research Dr.
Hilltop Industrial Park
Richmond, CA 94806
800/543-2294,
415/223-2766 (fax)

Wang Laboratories, Inc.
One Industrial Ave.
Lowell, MA 01851
800/225-9264,
508/967-5877 (fax)

WLT Systems, Inc.
800 Chelmsford St.
Lowell, MA 01851
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Wyse Technology
3471 N. First St.
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408/473-2080 (fax)

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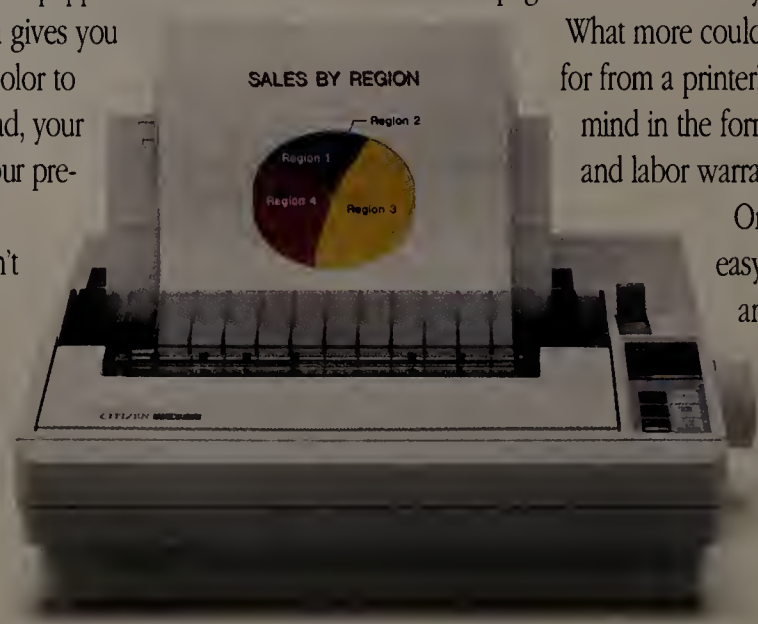

Once you've tried the new GSX-140, it'll be easy to see how it makes your reports brighter and life easier. For the dealer near you, just call 1-800-441-2345, ext. 34 in Calif., 1-800-556-2345, ext. 34 outside Calif.

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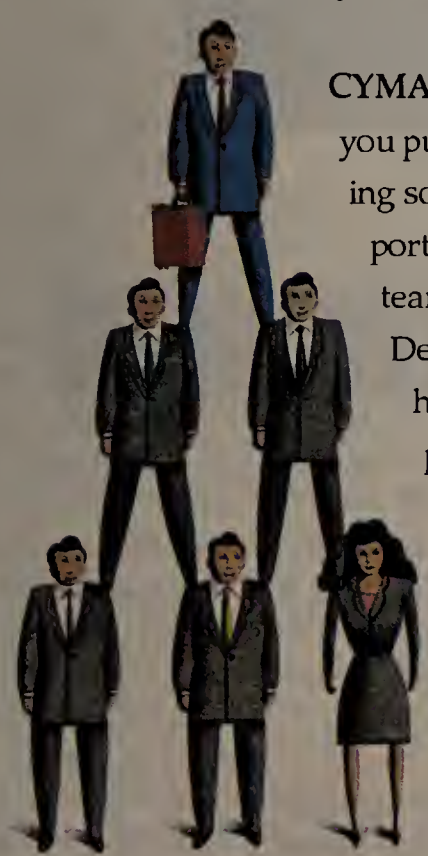

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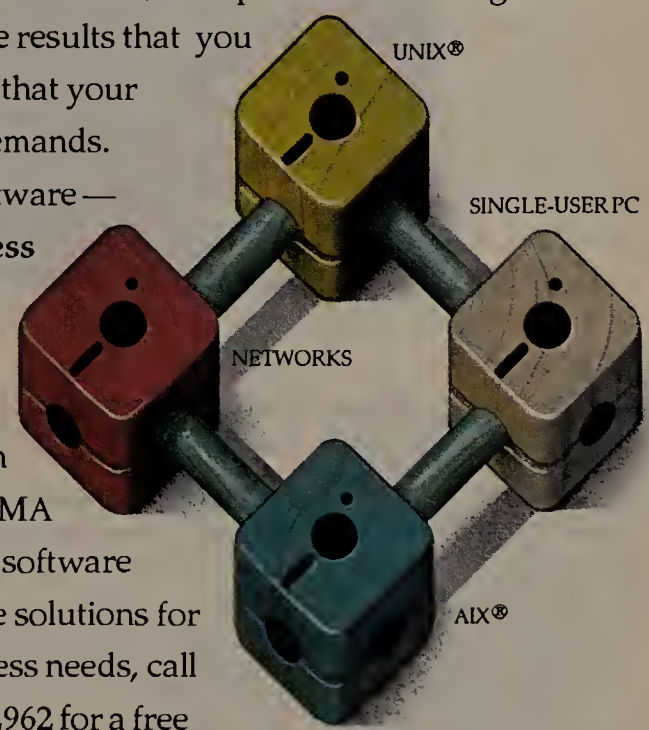

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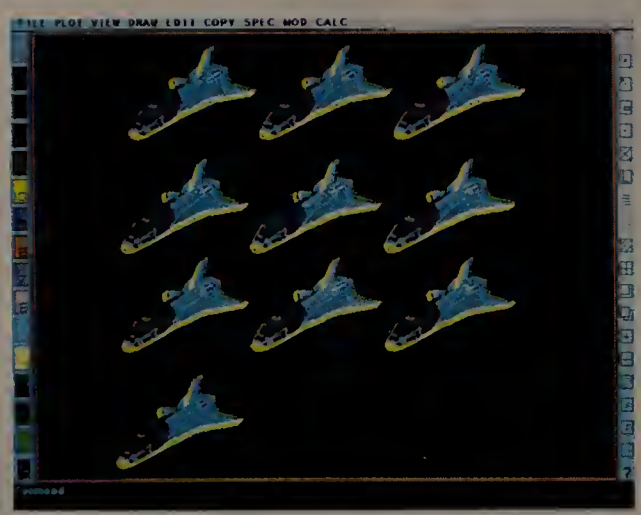

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Timing tests were done an ALR Flex Cache 386 33 MHz machine with 4 MB RAM, DOS 3 3 and a standard VGA card Drawings are shown after 74 seconds elapsed time

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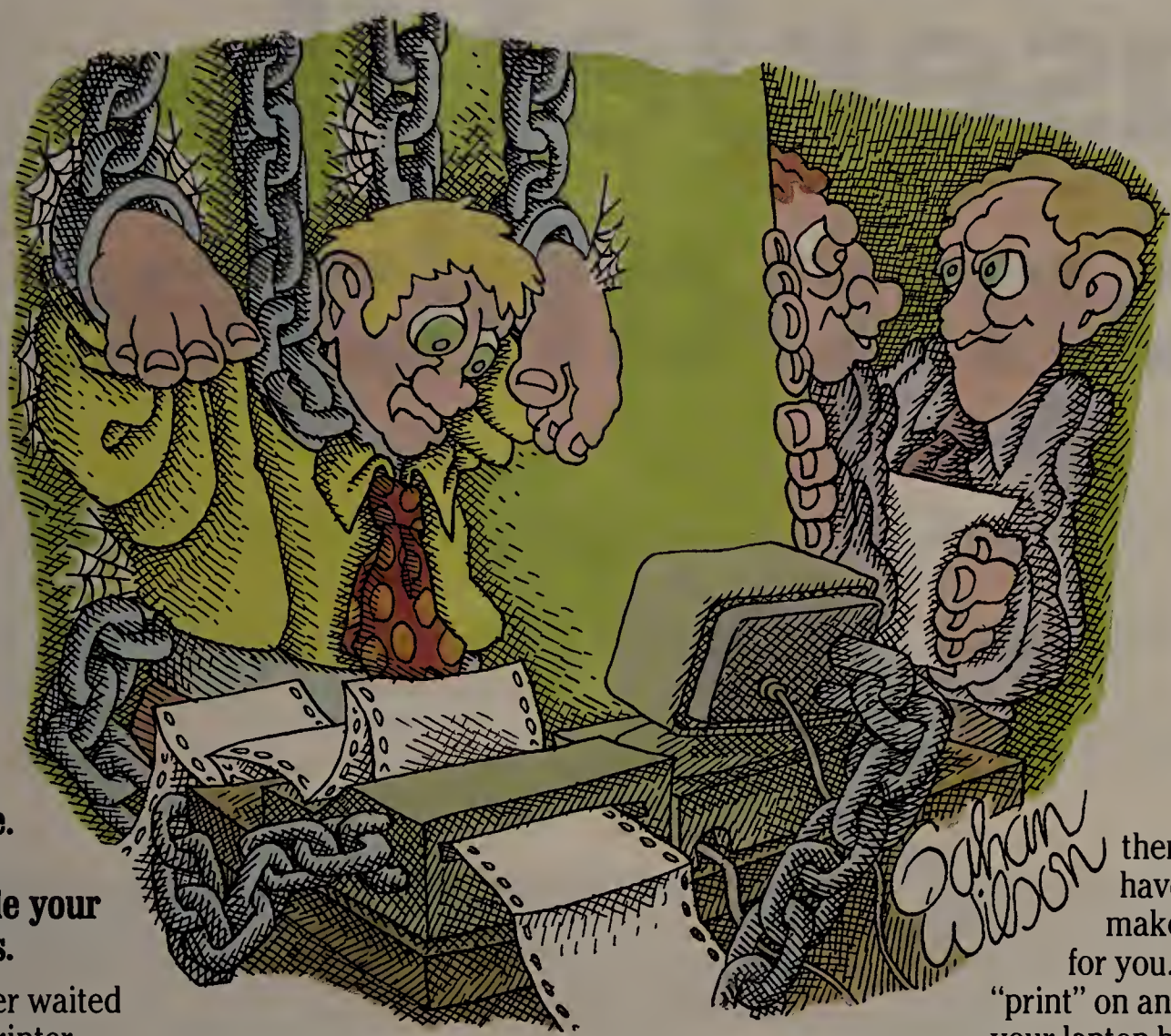
Circle 93 on reader service card

Still hanging around, waiting for your spreadsheets to print?



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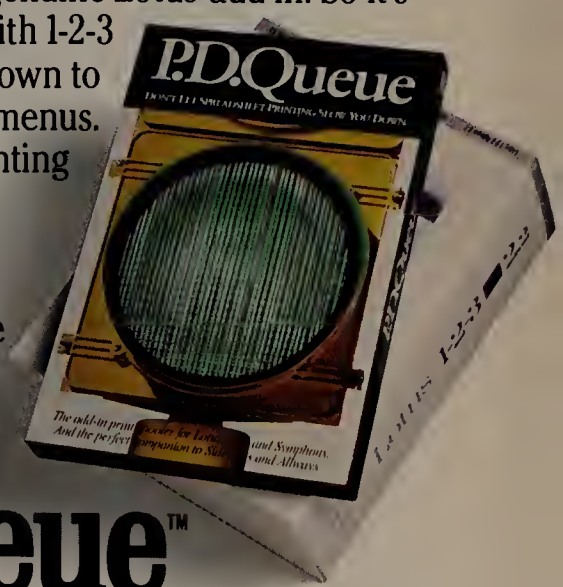

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Requires Lotus 1-2-3 Release 2.0, 2.01 or 2.2, or Symphony Release 1.1 or higher. Works while in 1-2-3, Symphony or any add-in.
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Circle 60 on reader service card

HARDWARE SPECIAL ISSUE

LaserJet II Compatibles

Why buy more printer than you need? If you're looking for basic graphics and fast text printing, this guide to 31 LaserJet II clones can help you meet an officeful of printing requirements.

Considering the PostScript-like features of the LaserJet III, investing in a LaserJet II compatible seems silly. After all, buying a LaserJet III is like getting a microwave for the price of a toaster: You get scalable fonts, resolution enhancement, and slick effects like rotated and shadowed text all for a measly $2395.

Unfortunately, most applications can't yet tap these special features, and people who need such finesse can get much more from a PostScript printer. Most of us will gladly settle for a toaster: a durable printer that handles simple graphics and cranks out text in a hurry—in other words, a LaserJet II. The problem is that HP doesn't sell it anymore. The solution? Try a LaserJet II clone.

This Buyers' Guide examines a host of laser printers that walk, talk, and print just like the LaserJet II. Thanks to longer duty cycles and faster engine speeds, many of the printers make more efficient LAN printers than the LaserJet III or the now-defunct II. Just remember that even the best imitations have limitations: While software written for the LaserJet II runs trouble-free on nearly all these printers, most can't use cartridges or other expansion products designed specifically for HP's unit.

Daniel Tynan and Cathy Smith

Romancing the Clones
Which printer should you choose as your work-group workhorse? If you shop carefully, you can find a laser that meets or beats the Series II and III in the key areas of price, speed, and durability. Here's what to look for:

Price The $2395 Series III sells on the street for well under $2000; you should pay a lot less for your laser or get a lot more printer in the bargain. But the price tag is only part of the story. For example, the Qume CrystalPrint costs almost 2 cents less per page than the PCPI LaserImage 1030—a difference that can add up to big savings over the life of the printer. Consider the cost and life expectancy of consumables and whether the print drum and toner cartridge come separately or as an integrated unit. Though integrated consumables are usually more expensive, they're also easier to install.

Speed Text-printing performance depends largely on engine speed. While the Series III clocks in at 8 ppm, the printers in this survey range from smaller 6-ppm machines to brawny 12-ppm units that can shoulder LAN-sized work loads.

Durability The III offers a monthly duty cycle of 16,000 pages and comes with a one-year warranty and HP's sterling reputation for reliability. Printers like IBM's LaserPrinter and Panasonic's KX-4450i offer even heftier duty cycles, and most are backed by solid one-year warranties. How can you gauge a printer's reliability before you buy? Check out the cost of the vendor's extended service contract. An expensive service agreement may mean the manufacturer expects the printer to require extensive repair.

Fonts None of the printers in this guide can match the Series III's font-scaling talents—and as simple text printers, they don't have to. Still, look for a generous selection of resident typefaces (the PCPI and Kyocera printers come with 38 and 79, respectively), plus compatibility with HP and third-party downloadable soft fonts, for those times when your documents demand a high-quality look.

Expandability The Series III comes with 1MB of RAM; the printers here come with between 512K and 1.5MB—fine for simple text printing, but not enough for downloadable fonts or full-page graphics. None of the printers accepts HP memory boards, so adding RAM may cost a little more—from $295 to $520 for a 1MB upgrade. And since few accept HP font cartridges and some don't work with PostScript emulators, you're also at the mercy of a vendor's proprietary options.

Paper Handling The III's paper capacity tops out at 200 sheets—far less than Kyocera's 1000-sheet options. Look for multiple trays, face-down output, and duplex printing options, as well as the ability to handle all the usual suspects—letter- and legal-sized paper, envelopes, labels, and transparencies.

Even in a graphical world, the vast majority of output will be documents and spreadsheets requiring a handful of fonts and minimal graphics. Unless you hunger for scalable fonts and flashy graphical effects, a fast, bread-and-butter

PIERRE-YVES GOAVEC

SERIES II COMPATIBLES: LASER POWER FOR YOUR LAN

			STANDARD FEATURES							EMULATIONS	
Manufacturer	Printer	List price	Standard RAM	Maximum RAM	Rated speed (ppm)	Monthly duty cycle (pages)	Cost of toner cartridge	Number of pages per cartridge	Estimated cost per page (cents)[1]	HPGL	EpsonFX
DATAPRODUCTS	LZR 650	$1695	512K	4.5MB	6	3000	$60	3000	2.8	y	y
	LZR 1230	$3695	512K	2MB	12	25,000	$31	5000	3	y	y
EPSON AMERICA	Epson EPL-6000	$1399	512K	4.5MB	6	3000	$29	1500	2.5	n	y [2]
FACIT	Facit P6060	$1599	512K	4.5MB	6	4000	$24	1500	3.4	n	n
FUJITSU AMERICA	RX 7200	$3995	640K	4.6MB	12	10,000	$68	10,000	3.5	y [2]	y
IBM	LaserPrinter	$2395	512K	4MB	10	20,000	$199 [3]	10,000	2	n	n
KYOCERA ELECTRONICS	F800A	$2295	512K	4.5MB	8	10,000	$40.95	4000	3.22	n	y
	F1000A	$2895	512K	1.5MB	10	10,000	$36.95	3000	3.37	n	y
	F2000A	$4695	1MB	5MB	10	10,000	$36.95	3000	3.37	n	y
MANNESMANN TALLY	MT905	$1499	512K	4.5MB	6	4000	$45 [4]	1500	3	n	y [2]
	MT906	$1695	512K	4.5MB	6	4000	$45 [4]	1500	3	n	y [2]
OFFICE AUTOMATION SYSTEMS	LaserPro EXEC	$1495	512K	4.5MB	6	3000	$47	1500	[5]	n	y [2]
	LaserPro LP 90/8	$2350	1MB	5MB	8	5000	$47	1500	[5]	y	y
OKIDATA	OkiLaser 800	$1795	512K	4.5MB	8	5000	$33	2500	3.2	n	n
	OkiLaser 820	$2295	512K	4.5MB	8	5000	$33	2500	3.2	n	n
OLIVETTI OFFICE USA	PG 306	$1595	512K	4.5MB	6	3000	$29	1500	2.5	n	y
PACKARD BELL	PB 9500	$2195	1.5MB	4.5MB	6	4000	$27.50	1500	[5]	n	y
PANASONIC COMMUNICATIONS & SYSTEMS	KX-4420 Laser Partner	$1695	512K	4.5MB	8	3000	$45	3000	2.9	n	n
	KX-4450i Laser Partner	$2095	512K	4.5MB	11	20,000	$45	5000	2.9	n	y
PCPI	LaserImage 1030-PP	$2395	1MB	5MB	6	3000	$32	1500	4.12 [6]	y	y
	LaserImage 1030-ID	$2795	1MB	5MB	6	3000	$32	1500	4.12 [6]	n	y
	LaserImage 1030-IS	$2995	1MB	5MB	6	3000	$32	1500	4.12 [6]	n	y
	LaserImage 2020-PP	$3495	1MB	5MB	8	10,000	$84	6000	3.4	y	y
	LaserImage 2020-ID	$3895	1MB	5MB	8	10,000	$84	6000	3.4	n	y
	LaserImage 2020-IS	$4095	1MB	5MB	8	10,000	$84	6000	3.4	n	y
QUME	CrystalPrint Super Series II	$1999	1.5MB	1.5MB	6	5000	$125 [3]	7500	2.3	y	y [2]
SHARP ELECTRONICS	JX-9500	$1795	512K	4.5MB	6	3000	$57	3000	2.7	n	y
TANDY	Tandy LP 950	$1599	512K	2MB	6	3000	$64.95	3000	3.1	n	y
TEXAS INSTRUMENTS	MicroLaser	$1799	512K	4.5MB	6	3000	$60	3000	[5]	n	y
TOSHIBA AMERICA	PageLaser6	$1549	512K [8]	4.5MB	6	4000	$49 [4]	1500	3.1	n	n
UNISYS	AP9210	$2395	512K	4MB	10	20,000	$195 [3]	10,000	2	y	n

[1] Vendor estimate, based on cost of toner, drum, and developer.
[2] Extra-cost option.
[3] Integrated drum, toner, and developer package.
[4] Package of two.
[5] Information unavailable.
[6] Includes cost of cleaning cartridges.

LaserJet clone may be all your office really needs—no matter how you slice it.

Daniel Tynan is an associate editor and Cathy Smith the editorial assistant for PC World.

WHERE TO BUY

Dataproducts Corp.
6200 Canoga Ave.
Woodland Hills, CA
91367
800/624-8999,
415/358-1990,
818/887-4789 (fax)

Epson America
20770 Madrona Ave.
Torrance, CA 90503
800/289-3776

Facit, Inc.
400 Commercial St.
Manchester, NH
03108
800/733-2248,
603-647-2724 (fax)

Fujitsu America, Inc.
3055 Orchard Dr.
San Jose, CA
95134-2022
800/626-4686,
408/432-1318 (fax)

		FONT SUPPORT			PAPER HANDLING				PORTS			
IBM Praprinter	PastScript option	Number af resident typefaces	Accepts HP fant cartridges	Accepts down-laadable soft fonts	Maximum number af paper trays	Paper capacity (standard/ maximum)	Prints legal enve-lapes, labels, transparencies	Facedown autput	Parallel/ serial	AppleTalk	Warranty	Reader service number
y	n	16	n	y	2	250/500	y	y	y/y	n	1 year	601
n	n	8	n	y	3	250/750	y	y	y/y	n	1 year	602
n	y	6	y	y	1	150/150	y	y	y/y	n	2 years	605
y [2]	y	6	y	y	1	150/150	y	y	y/y	n	1 year	606
y	n	8	n	y	2	250/500	y	y	y/y	n	90 days an-site	607
n	y	5	n	n	4	200/700	y	y	y/y	n	1 year	608
n	n	79	n	y	1	150/150	y	y	y/y	n	90 days	609
n	n	79	n	y	1	250/1000	y	y	y/y	n	90 days	610
n	n	79	n	y	2	250/1250	y	y	y/y	n	90 days	611
y [2]	n	6	y	y	1	150/150	y	y	y/y	n	1 year 90 days on-site	612
y [2]	y	6	n	y	2	150/400	y	y	y/y	y [2]	1 year 90 days on-site	613
y [2]	y	6	y	y	1	150/150	y	y	y/y	n	1 year	614
y	n	7	y	y	1	200/200	y	y	y/y	n	1 year	615
y	n	26	y	y	2	200/400	y	y	y/y	y [2]	1 year	616
y	n	26	y	y	2	200/400	y	y	y/y	y [2]	1 year	617
y	y	8	n	y	1	150/150	y	y	y/y [2]	n	1 year an-site	618
y	n	6	y	y	1	150/150	y	y	y/y	y	1 year	619
n	n	22	n	y	1	250/250	y	y	y/y [2]	n	1 year	620
y	n	28	n	y	2	500/500	y	y	y/y	n	1 year	621
y	y	38	n	n	2	250/400	y	y	y/y	n	90 days an-site	622
y	y	38	n	n	2	150/400	y	y	y/y	n	90 days an-site	623
y	y	38	n	n	2	150/400	y	y	y/y	n	90 days on-site	624
y	y	38	n	n	1	250/250	y [7]	y	y/y	n	90 days on-site	625
y	y	38	n	n	1	250/250	y [7]	y	y/y	n	90 days on-site	626
y	y	38	n	n	1	250/250	y [7]	y	y/y	n	90 days an-site	627
y	y	10	n	y	1	100/100	y	n	y/y	y	1 year	628
y	n	3	n	n	2	250/500	y	y	y/n	n	1 year	629
y	n	24	n	y	2	250/250	y	y	y/y	n	1 year	631
n	y	3	n	y	2	250/500	y	y	y/y [2]	y/y [2]	1 year	632
y	n	8	y	y	2	150/150	y	y	y/y	n	1 year	633
y	y	6	n	y	2	200/500	y	y	y/y	n	1 year	634

[7] Not legal-sized paper.
[8] 1MB required for 300-dpi resolution.

For more information about all products in this table, circle reader service no. 901.

IBM
Natianal Distributian Divisian
101 Paragan Dr.
Montvale, NJ 07645
800/426-2468

Kyocera Electronics
100 Randalph Rd.
Samerset, NJ 08873
201/560-0060,
201/560-8380 (fax)

Mannesmann Tally
8301 S. 180th St.
Kent, WA 98032
800/843-1347,
206/251-5520 (fax)

Office Automation Systems
9940 Barnes Canyan Rd.
San Diega, CA 92121
619/452-9400,
619/452-2427 (fax)

Okidata
Customer Infarmatian Center
532 Fellawship Rd.
Mt. Laurel, NJ 08054
800/654-3282,
609/778-4184 (fax)

UPGRADES FOR THE '90S #10

The (Almost) Ultimate Floppy Upgrade

The 2.8MB floppy drive may well be standard in the next generation of personal computers. But if you want to skip a generation—and store *lots* of data—Q/Cor's 3½-inch floppy drive, the Stor/Mor, is a sure bet. The drive can pack a whopping 21.4MB on special high-capacity floppies, and it's darn fast—although not quite as fast as Q/Cor claims. The Stor/Mor can't read or write 1.44MB or 720K floppies, but the drive is compatible with programs ranging from *Norton Utilities* to *Fastback* to NetWare and works in nearly any XT, AT, or compatible.

The Stor/Mor comes in both internal and external versions; the external unit examined here is pretty easy to install. You plug the controller into a free slot, connect it to the drive with a cable, and plug the drive's power supply into an AC outlet. Turn on your PC, copy a few utilities to the hard disk, reference a device driver in your CONFIG.SYS file, and that's about it. To format a 25MB floppy, you naturally use a supplied utility. You can even boot your PC from the Stor/Mor and partition its superfloppies as you would a hard disk. If you need floppy portability and hard disk storage, the Stor/Mor is one of the best options around. List price: external $895, internal $795, 25MB floppy disk $25. Q/Cor, One Meca Way, Norcross, GA 30093; 800/548-3420, 404/564-5528 (fax).

—*Robert Luhn*

Reader service no. 730

A Bernoulli alternative: the Stor/Mor holds 21MB on a floppy yet costs $895.

TONY CARLSON

WHERE TO BUY

Olivetti Office USA
765 U.S. Hwy. 202 S
Bridgewater, NJ 08807
201/526-8200, 201/526-8405 (fax)

Packard Bell Electronics
9425 Canoga Ave.
Chatsworth, CA 91311
818/773-4400

Panasonic Communications & Systems Co.
Two Panasonic Way
Secaucus, NJ 07094
800/742-8086, 201/348-7000

PCPI
10865 Rancho Bernardo Rd.
San Diego, CA 92127
800/225-4098, 800/262-0522 California, 619/487-5809 (fax)

Qume Corp.
500 Yosemite Dr.
Milpitas, CA 95035
408/942-4000, 408/942-4052 (fax)

Sharp Electronics Corp.
Sharp Plaza
Mahwah, NJ 07430-2135 201/529-9500

Tandy Corp.
1800 One Tandy Center
Fort Worth, TX 76102
817/390-3011

Texas Instruments
Information Technology Group
P.O. Box 202230
Austin, TX 78720
800/527-3500

Toshiba America Information Systems
Printer Products Division
9740 Irvine Blvd.
Irvine, CA 92718
714/583-3000

Unisys Corp.
P.O. Box 500
Blue Bell, PA 19424
800/448-1424

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2. ☐ 1-3 mos.
3. ☐ 4-6 mos.
4. ☐ 7-12 mos.
5. ☐ no plans

Are you:
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2. ☐ 25-29
3. ☐ 30-40
4. ☐ 41-50
5. ☐ 51-60
6. ☐ 61-70
7. ☐ 71 or older

Is your Household Income:
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2. ☐ $25,000-$34,900
3. ☐ $35,000-$49,900
4. ☐ $50,000-$75,000
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San Antonio, Texas 78228-9901

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For security conscious applications the Dauphin 1000 series can be configured as a diskless workstation. As your computing environment changes you may require a disk drive. There exist three ways of integration. A Dauphin 1050 housing which includes an internal disk drive with the same or upgraded CPU. Also available is an external floppy port for either 5 $^1/_4$" or 3 $^1/_2$" drives. An alternate solution is a proprietary screen stand with an external disk drive.

NETWORK READY

The Dauphin 1000 series is the first line of laptops to provide a proprietary network ready architecture as a standard. You can work under a DOS shell while running UNIX or ZENIX as a primary operating system. RAM and hard disk space is not a constraining factor. The Dauphin 1000 series can be expanded to 32 MB memory and optional 30, 40 or 60 MB hard drives. Bootable ROM makes the Dauphin 1000 the premier network capable workstation.

DETACHABLE SCREEN

The screen on the Dauphin 1000 series can be removed in a snap. It can also be attached to a screen stand that includes an external floppy drive. As a keyboard computer you can use your favorite external monitor at home, work or on the road. This is an ideal solution for people who need power yet every ounce they carry matters. You can pack this lightweight unit (less than 4 lbs.) in a briefcase or a backpack.

Dauphin Technology, Inc. 1125 East St. Charles Road, Lombard, Illinois, 60148 U.S.A Telephone 708 • 627 • 4004
In Canada, call our distributor LapTECH SYSTEMS Inc. at 800 • 561 • 4527

* This device has not been approved by the Federal Communications Commission. This device is not, and may not be, offered for sale or lease, or sold or leased until the approval of the FCC has been obtained.

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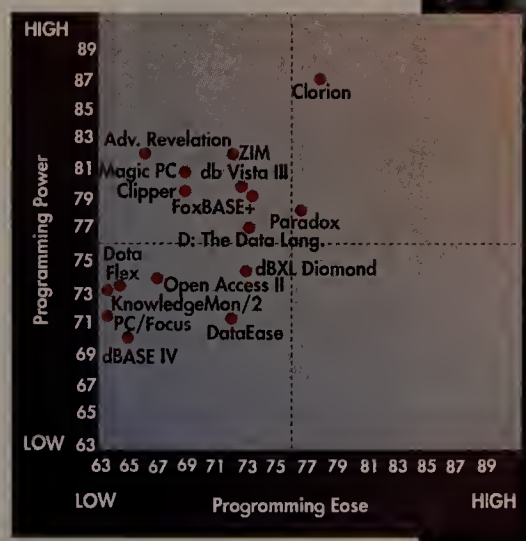

Here's what American corporations in a PC Week survey thought of the power and ease of use of Professional Developer vs. competitors. Any questions?

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CORPORATE TOP RATED PC WEEK 1989 SATISFACTION POLL

PC MAGAZINE EDITOR'S CHOICE NOVEMBER 15 1988 CLARION PROFESSIONAL DEVELOPER

INFO WORLD Clarion Professional Developer 8.2 Jul 4 1988

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Engenuity Systems
(602) 274-7993

CA, Fresno
Advanced Micro Systems
(209) 222-1776

FL, West Palm Beach
PC Systems
(407) 640-0811

ID, Pocatello
Data Solutions
(208) 232-9022

KY, Bardstown
Procom Prof. Computer Systems
(502) 348-1122

MI, Keego Harbor
Software Library Of Keego
(313) 681-6600

MN, Austin
C/M Computer Services
(507) 437-8886

TX, Houston
PC People
(713) 789-6300

CA, Concord
Whole Earth Access
(415) 686-2270

CA, Laguna Hill
Online Computer Systems
(714) 380-1730

GA, Riverdale
Common Sense Systems Inc.
(404) 473-1372

IL, Northbrook
ASAP Software Express Inc.
(708) 498-1235

MD, Baltimore
Compucare International Corp.
(301) 484-9052

MI, Inkster
All American Cash Register Inc.
(313) 561-4141

NY, Brooklyn
PC Plus LTD
(718) 692-2260

UT, Ogden
Knowledge Concepts Inc
(801) 392-1153

Circle 36 on reader service card

THE BEST OF THE FUTURE

Journey to the far future, to a time when Earth is uninhabitable, and you must find a new home for Mankind. The company that revolutionized combat flight simulation has taken another bold step with *Lightspeed*.

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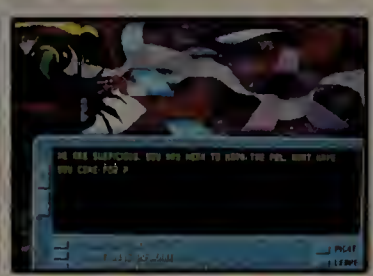
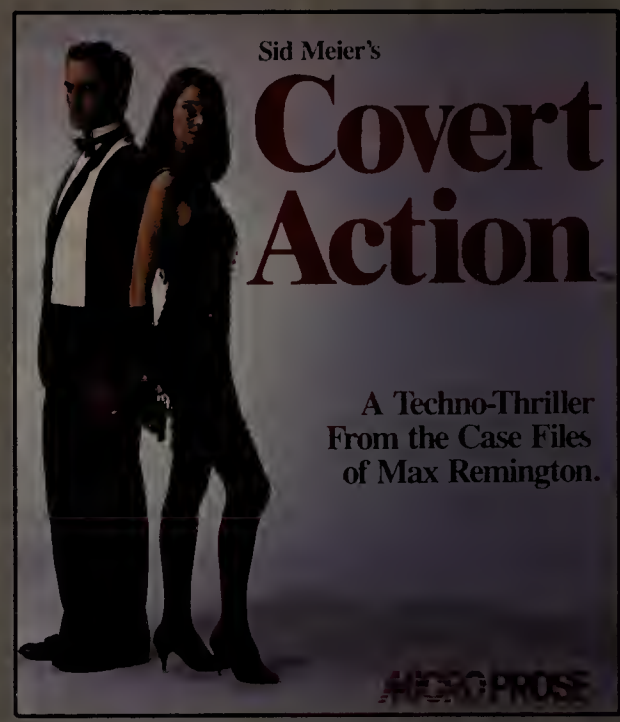
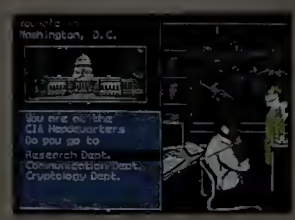
The first space game to combine sophisticated role-playing with state-of-the-art technology, *Lightspeed* is the future made available today. As always, MicroProse presents the Best of Times.





THE BEST OF THE PRESENT



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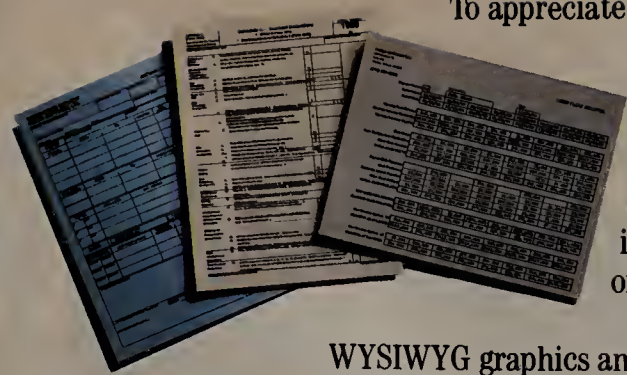

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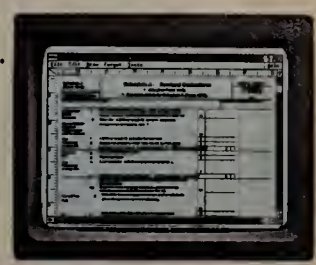

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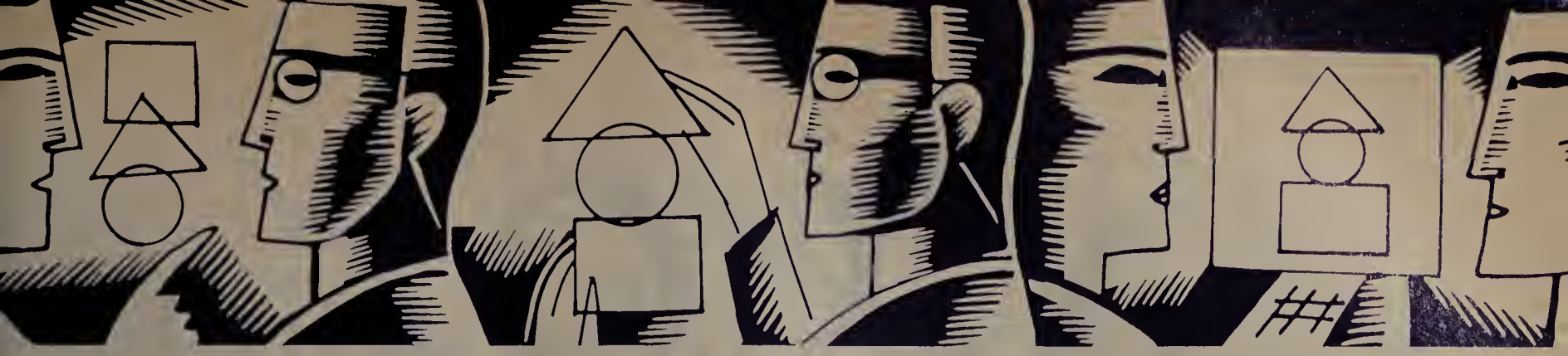

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Speed up your keyboard, detect 1-2-3's version number with a macro, improve point-and-shoot application launching in Windows 3.0's File Manager, print the unprintable on a DeskJet, and take your batch files to the carnival.

Edited by Tom Swan

Let Your Fingers Do the Flying

Good typists who are held back by a slow keyboard will appreciate a program I wrote, KBSETUP.C (see **LISTING 1**). It reprograms a keyboard's repeat delay and speed to really let your fingers fly. By lengthening or shortening the delay from when you press down on a key to when it starts to repeat and by adjusting the repeat rate, KBSETUP lets you fine-tune your keyboard to match your typing skills.

Enter the command **kbsetup m** to display a menu of choices. At the DOS prompt, enter **kbsetup** again, with two parameters. The first should be a letter from A to D, representing the delay you want; the second a value from 0 to 31 representing the desired speed. For example, **kbsetup a 0** gives you the shortest delay and fastest speed, while **kbsetup d 31** produces the longest and slowest.

Executing the program without parameters sets the keyboard rates to the

(continues)

```
/* kbsetup.c by Michael O'Connor */

#include <ctype.h>
#include <dos.h>
#include <stdio.h>
#include <stdlib.h>

#define ISIN(l,h,v)  ((l<=v)&&(v<=h))

int kbdelay = 0;     /* Default typematic delay */
int kbrepeat = 0;    /* Default repeat rate */

void usage(void)
{
  puts("ERROR: Type KBSETUP M for menu\n");
  exit(1);
}

void menu(void)
{
  clrscr();
  puts("\n\t\t\tKBSETUP MENU:\n\n"
       "\t  keyboard DELAY time == delay in msecs\n"
       "\t              A        ==       250\n"
       "\t              B        ==       500\n"
       "\t              C        ==       750\n"
       "\t              D        ==      1000\n"
       "\tkeyboard REPEAT rate  == characters per second\n"
       "0 == 30.0\t   8 == 15.0\t   16 == 7.5\t   24 == 3.7\n"
       "1 == 26.7\t   9 == 13.3\t   17 == 6.7\t   25 == 3.3\n"
       "2 == 24.0\t  10 == 12.0\t   18 == 6.0\t   26 == 3.0\n"
       "3 == 21.8\t  11 == 10.9\t   19 == 5.5\t   27 == 2.7\n"
       "4 == 20.0\t  12 == 10.0\t   20 == 5.0\t   28 == 2.5\n"
       "5 == 18.5\t  13 ==  9.2\t   21 == 4.6\t   29 == 2.3\n"
       "6 == 17.1\t  14 ==  8.6\t   22 == 4.3\t   30 == 2.1\n"
       "7 == 16.0\t  15 ==  8.0\t   23 == 4.0\t   31 == 2.0\n"
       "Syntax: kbsetup <A...D> <0...31>\n"
       "Default settings: A 0 (short delay, fast repeat)");
  exit(1);
}
```

(continues)

LISTING 1: Compile KBSETUP.C with Borland's Turbo C to create KBSETUP.EXE. Execute the program using the command KBSETUP M to display a menu of parameters for adjusting your keyboard's key-repeat delay and speed.

ANTHONY RUSSO

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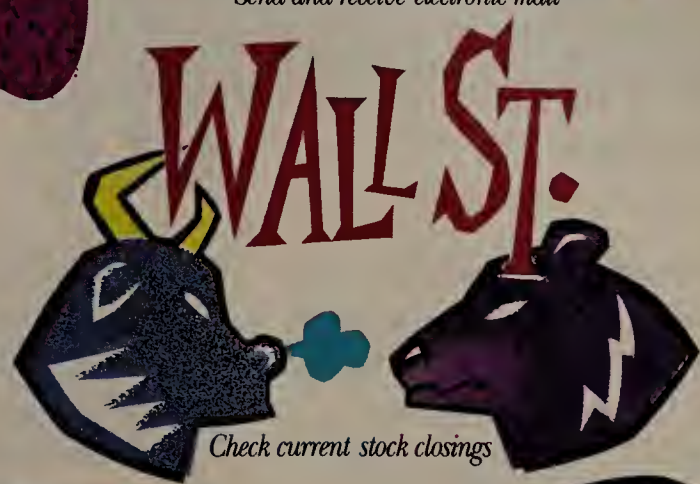

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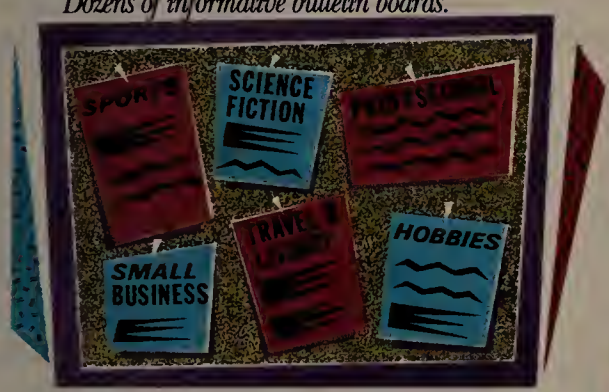

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Circle 133 on reader service card

```
void main(int argc, char *argv[])
{
  int i;

  if (toupper(argv[1][0]) == 'M') menu();
  else for (i = 1; i < argc; i++)
    if (isdigit(*argv[i])) {
      kbrepeat = atoi(argv[i]);
      if (!ISIN(0, 31, kbrepeat)) usage();
    } else {
      argv[i][0] = toupper(argv[i][0]);
      if (!ISIN('A', 'D', argv[i][0])) usage();
      kbdelay = argv[i][0] - 'A';
    }

  _AX = 0x0305;
  _BH = kbdelay;
  _BL = kbrepeat;
  geninterrupt(0x16);
}
```

LISTING 1 (continued)

default values A 0. Entering unrecognized parameters displays an error message reminding you of how to view the program's options.

Michael D. O'Connor
Damascus, Maryland

Editor's note: Use Turbo C *to compile KBSETUP.C, creating KBSETUP.EXE. Copy that file to a directory listed in your PATH statement. After running KBSETUP with parameters as described above, load a favorite program and experiment with the new settings in a familiar environment. You may have to run KBSETUP several times to find the parameters that work best for you.*

The program works by setting register AX to 0305hex, BH to the delay value, and BL to the typematic rate. Then geninterrupt() calls the ROM BIOS keyboard service (interrupt 16hex), executing function 0305hex, which sets the delay value and the typematic rate. IBM introduced this function in the PCjr, and most ATs support it. It's also available in all PS/2s. But if your ROM BIOS is dated earlier than 11/16/85 or if you have an XT, a PC, or a similar clone, then KBSETUP probably won't work on your system.

1-2-3 Version Detector

Our company uses versions 2.01 and 2.2 of *1-2-3*, and it's important that our files be compatible. I wanted to create a macro that would use *2.2*-specific commands when available and alternative instructions when run in *2.01*, but that meant the macro had to tell one version of the program from the other.

I combed my manuals but couldn't find an @VERSION function that determined which *1-2-3* version was running. Not to be beaten, I created my own solution. Assuming the worksheet is named VERSION.WK1, place the file-link expression **+<<version.wk1>>a1** into cell A1.

Version 2.2 evaluates this expression as 0 (and not, oddly enough, as a circular reference), but in version 2.01 it results in an ERR. This makes possible the sample macro (see **FIGURE 1**), which determines whether cell A1 contains an error. If so, it branches to a macro called ver_201. Otherwise, version 2.2 is active, and the ver_22 submacro runs.

```
{IF (@ISERR(A1))} {BRANCH ver_201}
{BRANCH ver_22}
```

FIGURE 1: This sample macro uses a file-link expression in A1 to check which version of 1-2-3 is running.

Chuck Indelicato
College Point, New York

Editor's note: Before running this macro, enter the text in **FIGURE 1** *in two cells, one on top of the other. In two cells that are not adjacent to those cells or each other, enter* **version 2.01** *and* **version 2.2**. *Use /*Range Name Create *to name these three macros* **\t**, **ver_201**, *and* **ver_22**, *respectively.*

To run the macro, go to an unoccupied cell and type **<Alt>-T**. *The version of* 1-2-3 *you're using will appear in the cell as a label.*

Adding Point-and-Shoot to Windows 3.0

In *Windows 3.0*'s File Manager, you can launch an application by selecting a data file if you've told *Windows* to associate the file's extension with a particular application. (You set associations in WIN.INI's [Extensions] section.) However, if an application handles files with any number of different extensions, as Notepad does, this method is impractical. To get around this weakness, I use the Recorder accessory and the Clipboard to design macros that pass any file name to a program.

Here's how you can create a macro that launches *Windows'* Notepad and loads the currently highlighted file. First, start Recorder from the *Windows* Program Manager's Accessories group window, then open the File Manager, going to a directory that contains a text file. Select that file to highlight its name. Return to Recorder and choose *Record* from the Macro menu. Give the macro a name—**<List Files>** for example—and set the Shortcut Key to an appropriate combination; <Ctrl>-<Alt>-E, for example.

You now need to copy the selected file name into the Clipboard by preparing

(continues)

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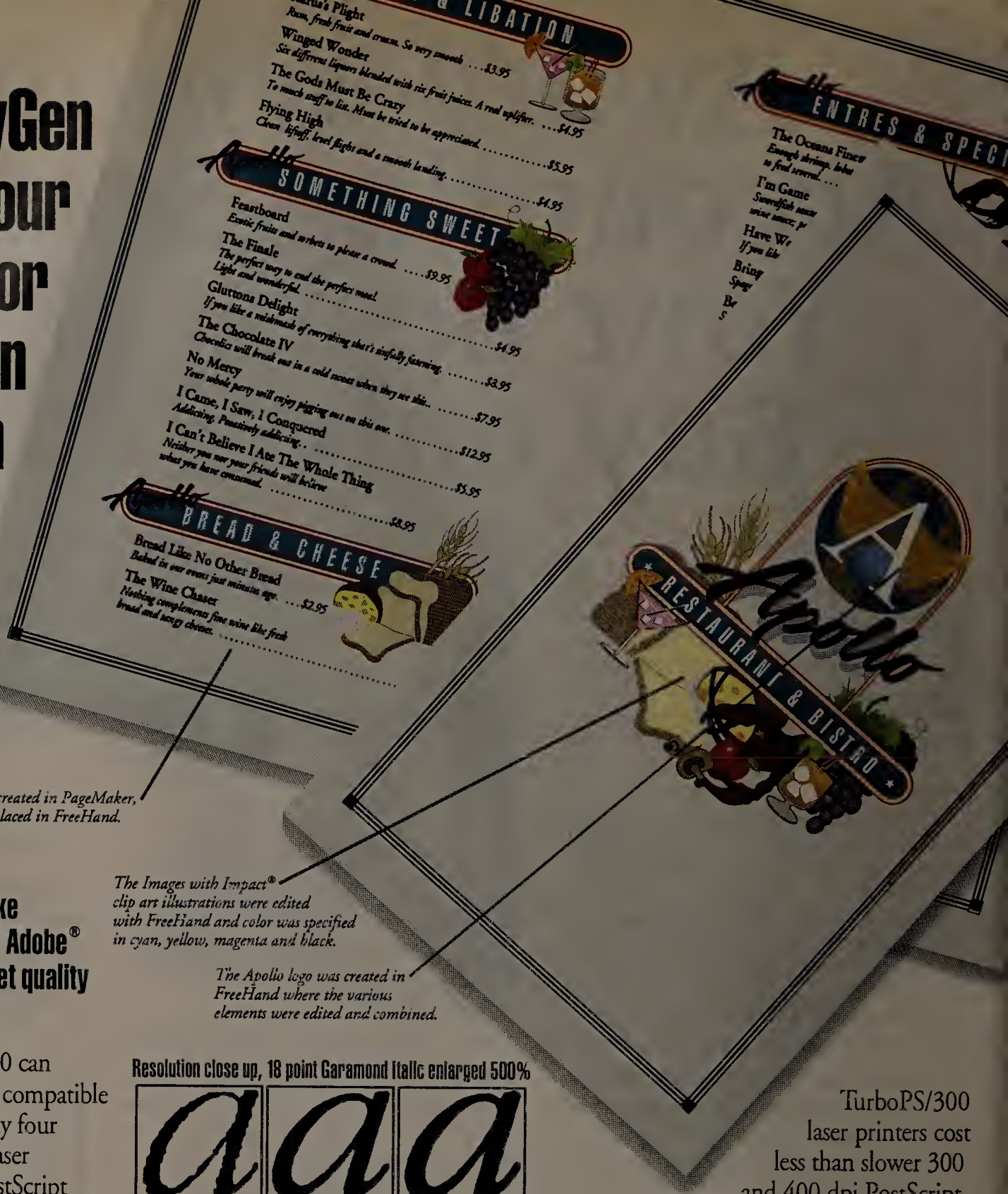

Text for the menu was created in PageMaker, saved as EPS files and placed in FreeHand.

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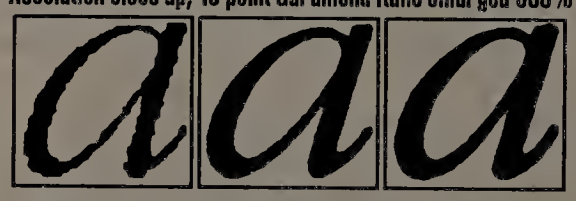

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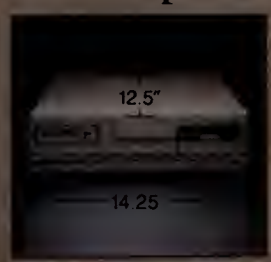

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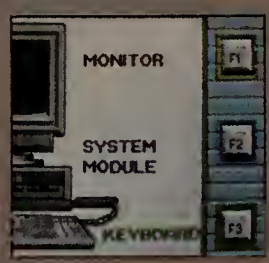

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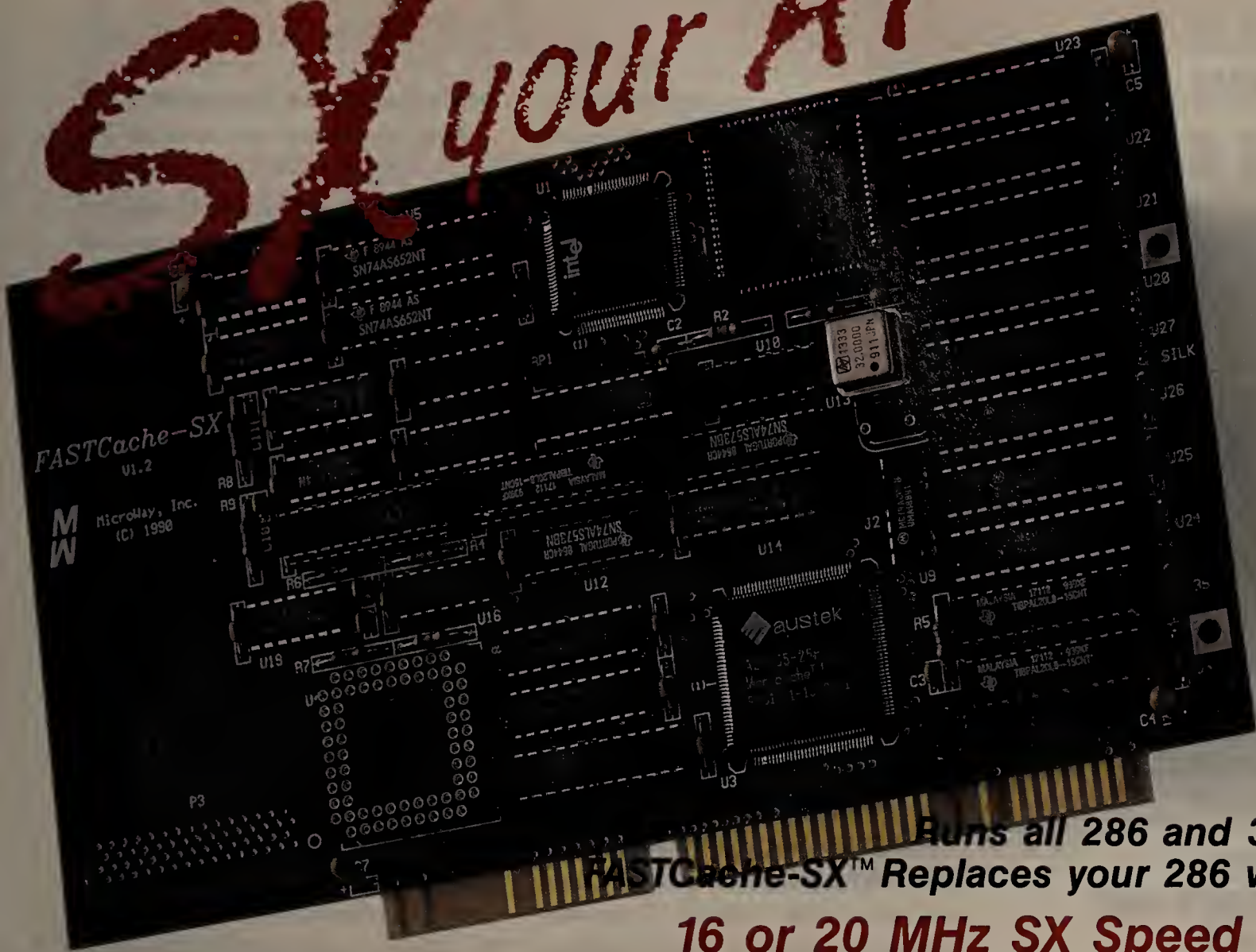

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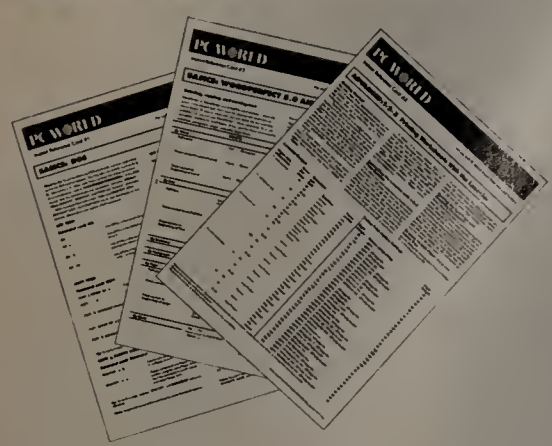

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and then aborting a print job. Press <Alt>-F and p to execute the File Manager's Print command. You should see the highlighted name of your file in the input box. Press <Ctrl>-<Insert> to transfer that name to the Clipboard. Then, press <Tab> twice, followed by <Enter> to cancel printing.

The next step is to press <Alt>-F to open the File menu. Press r to run a program, and then type **notepad** (or the name of another program you want to launch), followed by a space. Press <Shift>-<Insert> to copy the file name from the Clipboard to the Run command's input box. Press <Enter> to execute the Run command.

Before doing anything else, you must save the macro. Press <Ctrl>-<Break> to call up the Recorder's dialog box, and select *Save macro OK*. You can then quit Notepad by pressing <Alt>-FX.

To use Notepad to edit a file, open the File Manager, highlight the file name, and press <Ctrl>-<Alt>-E. If you want to pass file names to other programs, you can prepare similar macros, assigning them to various key combinations.

David L. Chu
Summit, New Jersey

Editor's note: I find Mr. Chu's technique handy for editing files that lack extensions, such as the README text files on program disks.

After creating the macro, be sure to save it in a Recorder data file. To do that, open Recorder if it's displayed as an icon, and select Save *from the File menu (press* <Alt>-FS*). Enter a file name with no extension—***macros***, for example—and press* <Enter>*. These steps save all current macros in MACROS.REC.*

To reload those same macros the next time you run Windows, *you can start the Recorder utility and open the MACROS.REC file (or whatever you named it). Or you can modify WIN.INI to do that automatically. Again using Notepad to edit WIN.INI, insert* **macros.rec** *into the 'load' command under the [windows] section header, so that the command reads something like 'load=nwpopup.exe macros.rec'.*

Finally, although you can use Mr. Chu's macro to run DOS programs, you'll need to slightly modify the process described above. After executing the File Manager's Run command, return to the Recorder by holding down <Alt> *and pressing* <Tab> *repeatedly until 'Recorder' appears at the top of the display or until the Recorder window or icon is selected. Release the* <Alt> *key, and press* <Ctrl>-<Break> *to call up the Recorder's dialog box. Save the macro in the usual way, and then quit your DOS application.*

Printing the Unprintable

Hewlett-Packard DeskJet printers provide near-laser-quality printing at a much lower cost. But there are drawbacks. For one, the DeskJet prohibits you from printing close to the edge of the paper, so text files with 80-column lines don't always print correctly. Two files, DRAFT.CTL (see **FIGURE 2**) and DRAFT.BAT (see **LISTING 2**), solve this problem.

DRAFT.CTL contains the DeskJet control codes that adjust the printer margins to allow full pages of text to print. By changing the vertical and horizontal motion indexes, the file also leaves enough room at the left margin for loose-leaf binder holes.

DRAFT.BAT sends the codes in DRAFT.CTL to the printer, then calls the DOS PRINT utility to print up to nine files. Be sure that you specify DRAFT.CTL's correct drive and path name in place of 'c:\path' in the TYPE command.

The batch program is especially well

(continues)

```
Ec(s1QEc&a5Ec&l7.27cEc&k11.25H
```

FIGURE 2: DRAFT.CTL contains the DeskJet printer control codes that DRAFT.BAT (see LISTING 2) sends.

PC WORLD

Instant Reference Card #7

For use with PC World Instant Reference Card Portfolio

BASICS: WINDOWS 3.0

STARTING WINDOWS 3.0

What to do: By default, *Windows 3.0* runs in its most appropriate mode, based on your hardware setup. You may, however, want to start it in another mode. On a 386 computer, for example, real mode is used to run a program designed for *Windows 2.xx*. Use these commands at the DOS prompt to load *Windows 3.0* in the desired mode:

Command	Mode	CPU required
WIN	Automatic selection	8088 or better
WIN/E	Enhanced	80386 or better
WIN/S	Standard	80286 or better
WIN/R	Real	8088 or better

WINDOW OPERATIONS

What to do: These steps work with any window. **Note: <Alt>-<Space>** opens the Control menu for a running application; **<Alt>-<Minus>** opens it for the current document or program group window. Menu names and options you select with the mouse are shown in italics; "double left" means click the left mouse button twice. The control menu box referred to is the little gray box in the top left corner of every *Windows* application window.

Fold Here

WINDOW OPERATIONS (continued)

Action	Point at/Click	Keyboard command
Select application window or icon	Window or icon/Left	Hold **<Alt>**, **<Tab>** until highlighted
Switch back to last active application	Window or icon/Left	**<Alt>-<Tab>**
Select group window or icon	Window or icon/Left	Hold **<Ctrl>**, **<Tab>** until highlighted
Size a window	Border or corner/ Hold left, drag border outline/Release	**<Alt><Space>S** or **<Alt><Minus>S**, choose border with cursor keys, size window with cursor keys, **<Enter>**; repeat for each border
Move a window	Window title bar/ Hold left, drag outline/ Release	**<Alt><Space>M** or **<Alt><Minus>M**, use cursor keys to move, **<Enter>**
Minimize window to icon	Minimize button/Left	**<Alt><Space>N** or **<Alt><Minus>N**
Restore application or group icon to window	Icon/Double left	Select icon, **<Enter>** if group icon
Maximize application or group icon to full-screen window	Icon/Left, *Maximize*/Left	Select icon, **<Alt><Space>X** or **<Alt><Minus>X**
Maximize window to full screen	Maximize button/Left	**<Alt><Space>X** or **<Alt><Minus>X**
Close current document window	Control menu box/ Double left	**<Ctrl>-<F4>**
Close current application window	Control menu box/ Double left	**<Alt>-<F4>**
Display Task List and switch to another program	Control menu box/Left, *Switch to*/Left, select desired program, *Switch to*/Left	**<Ctrl>-<Esc>**, select desired program, **<Enter>**

WINDOW OPERATIONS (continued)

Put full-screen DOS program in window (Enhanced mode only)	none	**<Alt>-<Enter>**
Make DOS program full screen (Enhanced mode only)	Control menu box/Left, *Settings*/Left, *Full Screen*/Left, *OK*/Left	**<Alt>-<Enter>**

Tip: When running DOS applications in a window, clicking the left mouse button will turn on the text selection mode. The word *Select* will appear in the title bar, and you won't be able to operate the program. To return to normal operation, click the right mouse button or press **<Esc>**.

PROGRAM MANAGER OPERATIONS

What to do: Normally, when you first run *Windows*, Program Manager appears full screen, with the Main window center screen. From there you can load applications, add new ones to Program Manager, and create new program groups. Although *Windows 3.0* is designed to be used with a mouse, many of the following keyboard shortcuts can save you time.

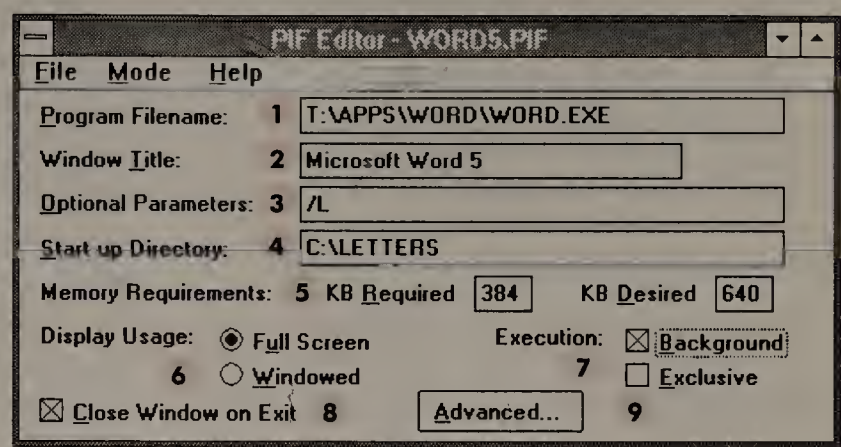
Fold Here

PROGRAM MANAGER OPERATIONS (continued)

Action	Point at/Click	Keyboard commands
Select and open program group window	Program group icon/ Double left	**<Ctrl>-<Tab>** to group icon, **<Enter>**
Select a program icon	Program icon/Left	Cursor keys
Run a program	Program icon/Double left	Select program icon, **<Enter>**
Move program to new group	Program icon/Hold left, drag to new group/ Release	Select program icon, **<Alt>FM**, **<Cursor Down>** to select group, **<Enter>**
Add new program to selected program group	*File*/Left, *New*/Left, *OK*/ Left, type description, **<Tab>**, type path and file name, *OK*/Left	**<Alt>FN<Enter>**, type description, **<Tab>**, type path and file name, **<Enter>**
Create new program group	*File*/Left, *New*/Left, *Program Group*/Left, *OK*/Left, type description, **<Tab>**, type file name, *OK*/Left	**<Alt>FNG<Enter>**, type description, **<Tab>**, type file name (no extension), **<Enter>**
Change printer	Control Panel icon/ Double left, Printers icon/Double left, select printer/Left, *Active*/Left, *OK*/Left, control menu box/Double left	Cursor to Control Panel icon, **<Enter><Alt>SP**, cursor to printer, **<Tab>**, cursor to *Active*, **<Enter>** **<Alt>-<F4>**
Exit Windows and save current desktop	Control menu box/Double left, *Save changes*/ Left, *OK*/Left	**<Alt>-<F4><Alt>S** **<Enter>**

Notes: You can combine mouse and keyboard procedures. For example, select a program icon with the mouse, and press **<Enter>** to run it. Once you've saved the desktop you want, make sure the Save Changes box is not checked when you exit *Windows*.

Tip: If you're trying to add *1-2-3* to a program group, for example, and can't remember where 123.EXE is, select the Browse button and sift through the directories to find the right executable file (EXE, COM, or BAT).



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ADVANCED: WINDOWS 3.0

FILE MANAGER OPERATIONS

What to do: File Manager displays a directory tree of the current drive, with directories shown as folders. Those with a plus sign contain subdirectories.

Action	Point at/Click	Keyboard commands
Change disk drives	Drive icon/Left	**<Ctrl>**-*drive letter*
Select directory	Directory name/Left	Cursor or letter keys
Expand a branch	Directory folder/Left	Select directory, **<Plus>**
Show all directories	*Tree*/Left, *Expand All*/ Left	**<Ctrl>-<*>**
Collapse a branch	Directory folder/Left	Select parent directory, **<Minus>**
Display directory's files in a window	Directory name/Double left	Select directory, **<Enter>**
Select a file	File name/Left	Cursor or letter keys
Select adjacent files	First file name/Left, hold down **<Shift>**, last file name/Left	Select first file name, **<Shift>-<Cursor Down>**

Fold Here

FILE MANAGER OPERATIONS (continued)

Action	Point at/Click	Keyboard commands
Select nonadjacent files	First file name/Left, hold **<Ctrl>**, select more files using left button	**<Shift>-<F8>**, cursor to desired files, **<Space>** to select
Select all files in window	*File*/Left, *Select All*/Left	**<Ctrl>-/**
Deselect all files in window	*File*/Left, *Deselect All*/ *Left*	**<Ctrl>-**
Delete selected files or directories	*File*/Left, *Delete*/Left, *Delete*/Left, *Yes*/Left	**<Delete><Enter>**, **<Enter>** to confirm
Copy selected file(s)	*File*/Left, *Copy*/Left, Type destination file name, *Copy*/Left	**<F8>**, type destination file name, **<Enter>**
Move selected file(s)	*File*/Left, *Move*/Left, type destination directory, *Move*/Left	**<F7>**, type destination directory, **<Enter>**
Rename selected file or directory	*File*/Left, *Rename*/Left, type new file name, *Rename*/Left	**<Alt>FN**, type new file name, **<Enter>**
Run program	Program file/Double left	Select program file, **<Enter>**
Associate data file extension with program	Select file, *File*/Left, *Associate*/Left, type program path and name, *OK*/Left	Select file, **<Alt>FA**, type program path and name, **<Enter>**
Find a file or directory	*File*/Left, *Search*/Left, type name (may include ? and *), *Search Entire Disk*/Left, *OK*/Left	**<Alt>FH**, type name (may include ? and *), **<Alt>E<Enter>**

Tips: You can move selected files or directories elsewhere on the same drive simply by dragging the appropriate icons from one File Manager directory window to another. To make copies on the same drive, hold down **<Ctrl>** while dragging. If you drag them into a directory window of a *different* drive, the files are copied. To move files to a different drive, hold down **<Alt>** while dragging. To speed deletions, select *Confirmation* from the Options menu, and uncheck 'Confirm on Delete'.

CREATING PIF FILES

What to do: PIF files control how DOS programs run in Windows, from memory to window size. This example shows the PIF editor in *Windows'* Enhanced mode. To create a PIF file, double-click the PIF Editor icon in the Accessories group, and fill in the displayed form. Save the PIF file, and add it to a group window as you would any new program.

PIF Editor - WORD5.PIF
File Mode Help

Program Filename: 1 T:\APPS\WORD\WORD.EXE

Window Title: 2 Microsoft Word 5

Optional Parameters: 3 /L

Start up Directory: 4 C:\LETTERS

Memory Requirements: 5 KB Required 384 KB Desired 640

Display Usage: ● Full Screen ○ Windowed 6

Execution: ☒ Background ☐ Exclusive 7

☒ Close Window on Exit 8

Advanced... 9

Fold Here

CREATING PIF FILES (continued)

1. Type the program's drive, subdirectory, and executable file.

2. Type the name you want to appear below the program's icon.

3. Type the parameters you'd issue when running the program from DOS. Type a question mark if you want *Windows* to prompt for a parameter when the program is run.

4. Type the drive and directory the program should log on to when it runs, such as a document or worksheet directory. **Note:** The program's directory must be in the system's PATH statement.

5. Enter the minimum memory requirement, and the maximum you want to allocate (up to 640K). If you enter **-1** in either box, the application gets all available conventional RAM.

6. Select whether the program will run full screen or in a window. **Note:** If the program uses a mouse, pick *Full* Screen.

7. Select *Exclusive* if you want the program to monopolize the PC; other programs will be suspended. Choose *Background* if the program should be active when placed in the background.

8. Check this box to return automatically to *Windows* when you exit the program. If you don't, you'll have to type **<Alt><Space>C** to shut the program's window.

9. Click this button to display the Advanced Options screen, where you can more precisely allocate memory and processor time, among other options. For most users, however, the default settings will suffice.

If you use a lot of DOS programs, you may want to explore the Advanced Options screen—CPU-intensive programs like spreadsheets may need a higher value than word processors and similar programs. Under Multitasking Options, you can dictate how much *relative* processing time a program gets. Memory Options let you dole out or restrict expanded (EMS) and extended (XMS) memory use. Under 'Other Options', you can reserve keys for your program that *Windows* would normally use—such as <Alt>-<Tab>.

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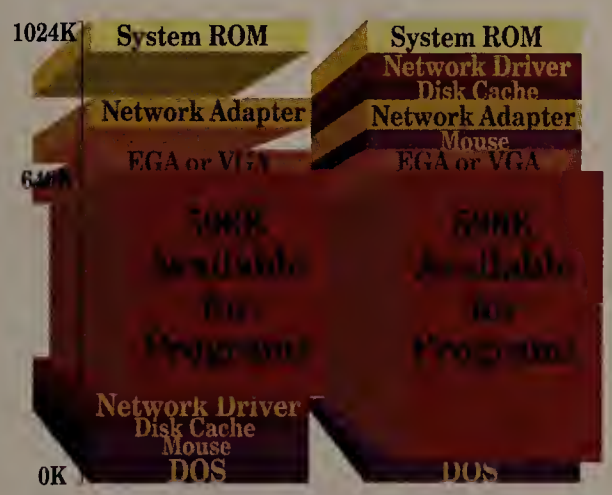

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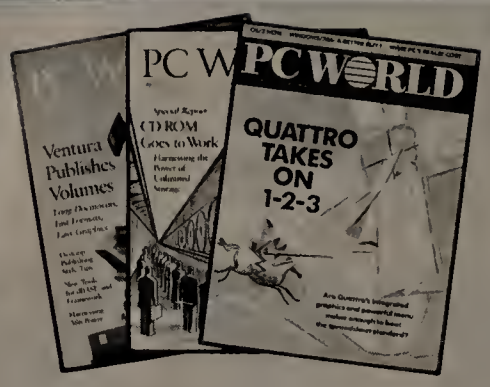

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Circle 31 on reader service card


```
@echo off
type c:\path\draft.ctl >prn
print %1 %2 %3 %4 %5 %6 %7 %8 %9
```

LISTING 2: DRAFT.BAT prepares a DeskJet for printing 80-column text, then uses PRINT.COM to print up to nine files.

suited for printing README files. Pages will break at perforations, there will be room for hole punches, and printing is done in draft mode, which conserves ink.

Jon D. Morrow
Chicago, Illinois

Editor's note: When entering DRAFT.CTL, you must insert an Escape code in the four places ^[*appears. Some editors, such as* Microsoft Word, *let you enter an Escape character by holding down* <**Alt**> *while you type* <**27**> *on the numeric keypad.*

If your editor doesn't allow inserting Escape codes, use @ signs instead; then, at the DOS prompt, enter **edlin draft.ctl** *to load the file into the DOS EDLIN utility. Type* **1r@**, *press* <**Ctrl**>-**Z**<**Ctrl**>-**V**, *type* <**[**, *and press* <**Enter**> *to change the four @'s to Escape codes. Then press* **e**<**Enter**> *to save your changes to disk and quit EDLIN. Also, make sure that DRAFT.BAT and the DOS PRINT.COM utility are in a directory listed in the current DOS path before running DRAFT.*

Tom Swan is a contributing editor for PC World *and the author of several books, including* Mastering Turbo Debugger *(Howard W. Sams and Co., Carmel, Indiana, 1990).*

Have a macro, batch file, short program, or general tip you're proud of? Star-Dot-Star *pays $25 to $200 per tip used. Send your tips to* Star-Dot-Star, PC World, *501 Second St. #600, San Francisco, CA 94107; CompuServe 74055,412; MCI Mail PC World Editorial; or 415/442-1891 (fax). We cannot acknowledge submitted materials.*

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They Left out Features....

We Left out the COMMA!!

The only thing missing...

is the comma in the price. If you look at the chart on the right you will see prices charged by our competition. All but one contain a comma. DesignCAD 3D sells for $399.00. Period. No Comma!

In order to draw the complex pictures shown below it is desirable to have the following 3D features:

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- **Blending of surfaces**
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$399

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CADKEY 3.12	$ 3,195.00	Solids $995.00 IGES translator $1,995.00
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DesignCAD 3D ver. 2.0	$ 399.00	NO expensive options! IGES Free, Shading Free
MaxxiCAD 1.02	$ 1,895.00	N/A
Mega Model	$ 995.00	MegaDraw $195, List $295, MegaShade $395
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Source: Byte Magazine

BYTE MAGAZINE SAYS...

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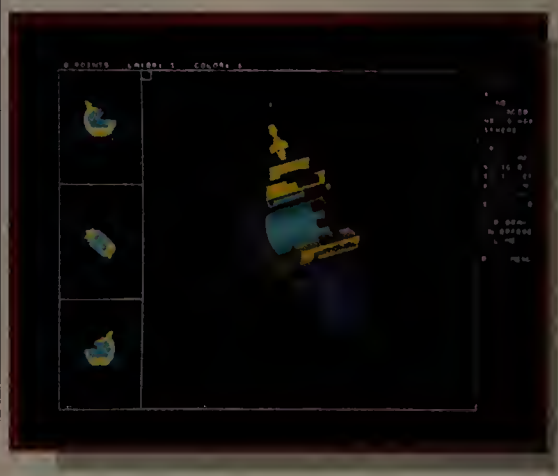

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DEVELOPER'S TOOLBOX

Batch File Thrills

Tom Swan

Has the thrill of completing your first batch file program melted like a snow cone in June? If so, you're not alone. Like thrill seekers looking for that ultimate roller coaster ride, most batch file programmers are disappointed to discover that batch commands have serious limitations and that the kicks just get harder to find. For example, there are no WHILE or REPEAT loop-the-loops available to batch programs as there are in C and Pascal. File, string, and display functions are as plentiful as honest wheels of fortune in a shore-town amusement park. And I'd sooner guess weights for a buck on the beach than use a batch program to detect expanded memory.

Then I tried a new version of *The Builder* from Hyperkinetix. The product is a combination compiler and text editor that can convert BAT files into EXE or COM executable programs. If you prefer writing batch files to using more complete languages like C and Pascal but have cursed DOS's meager set of standard batch commands, *The Builder* is your ticket to adventure.

Using *The Builder* is as easy as crashing bumper cars. Just load or enter a BAT file into the built-in editor, press a key, and wait a few seconds as the program converts your batch commands to an intermediate format and then compiles the text. The result is an OBJ file similar to that produced by most high-level languages. This is then linked to create the final EXE or COM program. The entire process is automated, but you can execute the steps individually if necessary—if, for example, you wanted to use another linker instead of *The Builder*'s.

The product's extensions to standard batch commands are what make *The Builder* truly exciting. The intermediate language to which the program converts BAT files includes CASE, REPEAT, and WHILE control structures. (You can also use the language to write new programs.) There are functions that determine the current drive and detect whether a subdirectory exists—key features for writing goofproof application installers, one of the most difficult chores to accomplish with plain batch commands.

Other functions in *The Builder*'s library include keyboard handlers for getting responses from program users, file and string operations, display controls, and menu commands for creating pop-up and pulldown menus. A complete set of functions tells you how much expanded RAM is available.

While the forms of these and other commands differ significantly from standard batch commands, if you can write moderately complex batch programs you'll have no trouble mastering *The Builder*'s intermediate language. To help you learn the twists and turns quickly, the product comes with several helpful examples, including a menu program that you can use as a template.

When it comes to thrills, I usually try to get mine with both feet on solid ground. But I'll ride with *The Builder* anytime. While writing batch programs, I don't even scream much anymore.

Let's talk it over. My MCI Mail handle is TSWAN; my CompuServe ID is 73627,3241.

WHERE TO BUY

The Builder
Hyperkinetix, Inc.
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Casta Mesa, CA 92626
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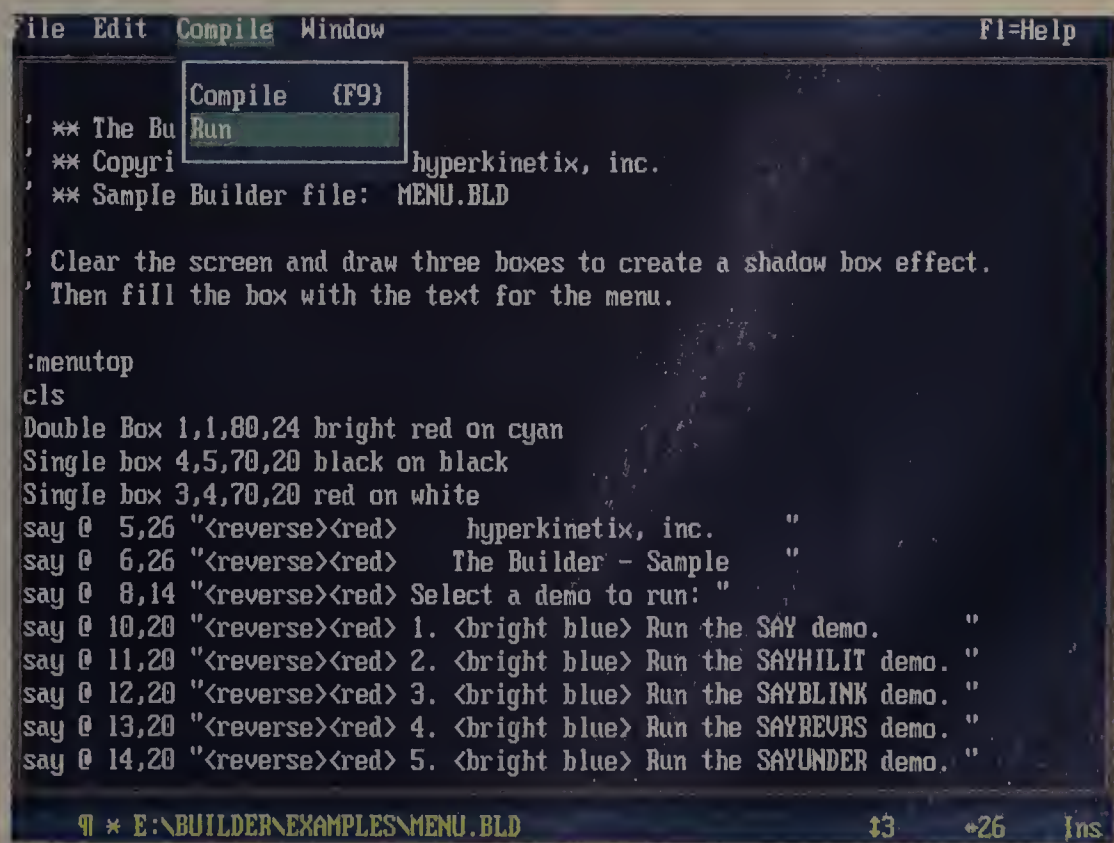

The Builder compiles standard BAT files to EXE or COM programs, and it also lets you write programs in an intermediate language, used by the menu program shown here.

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October 16, 1990
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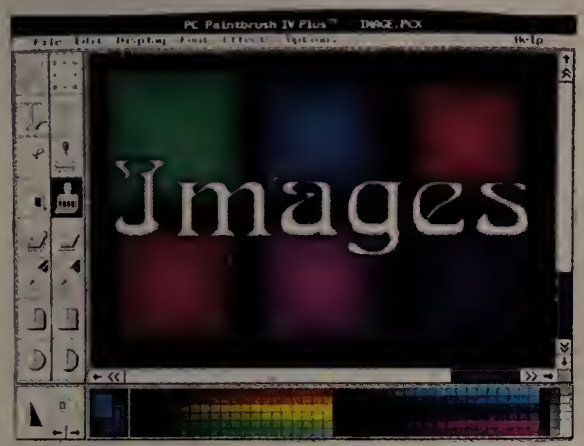

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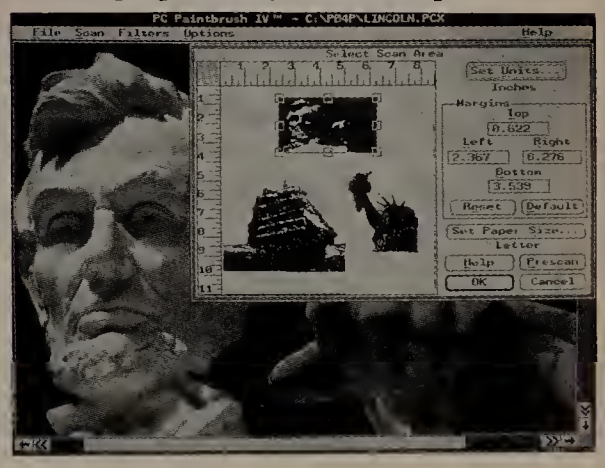

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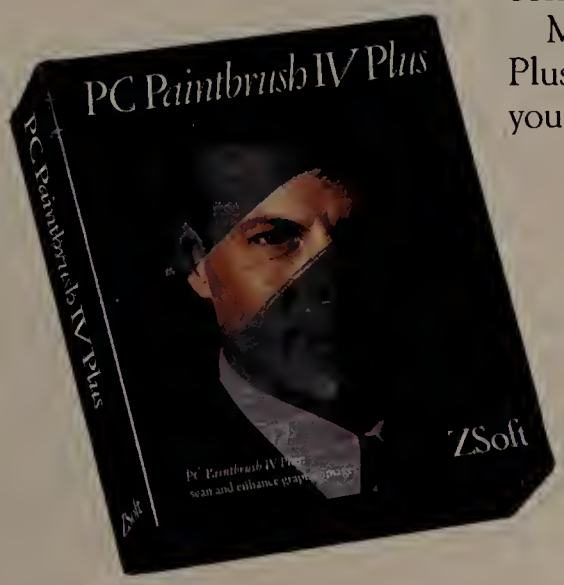

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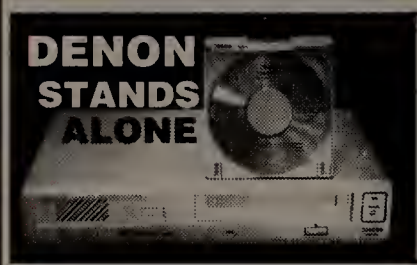

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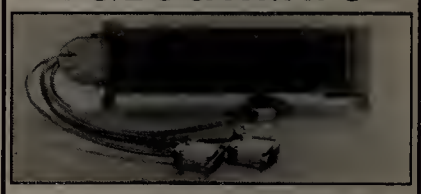

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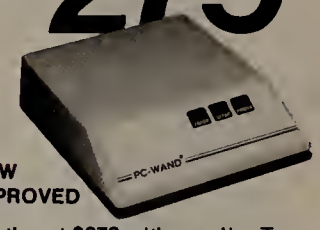

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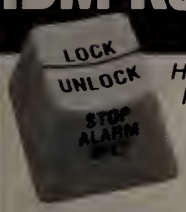

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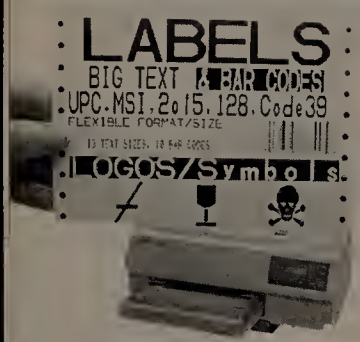

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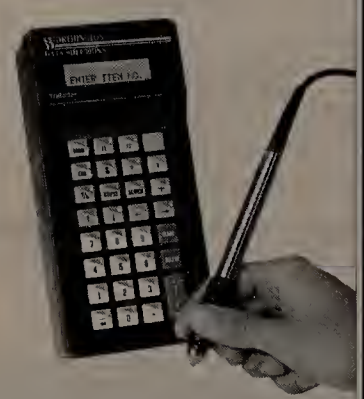

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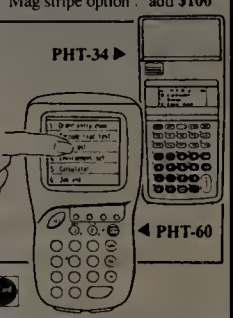

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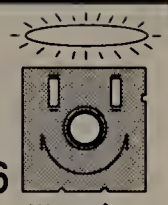

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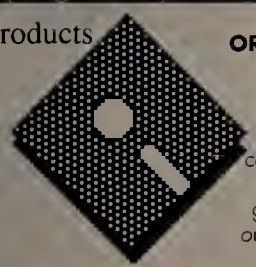

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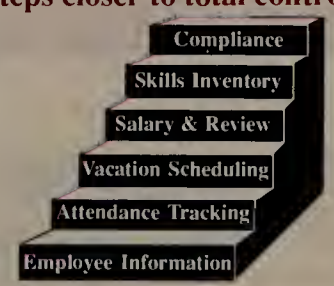

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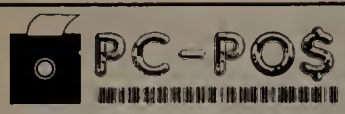

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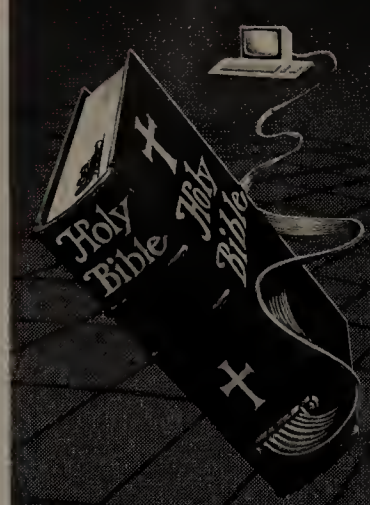

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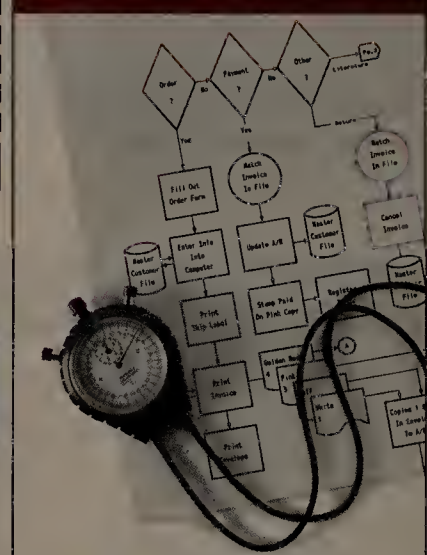

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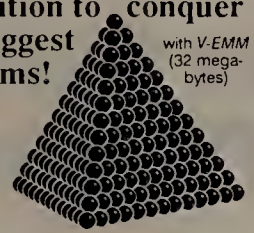

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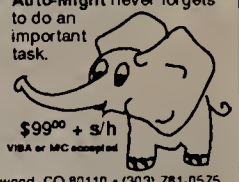

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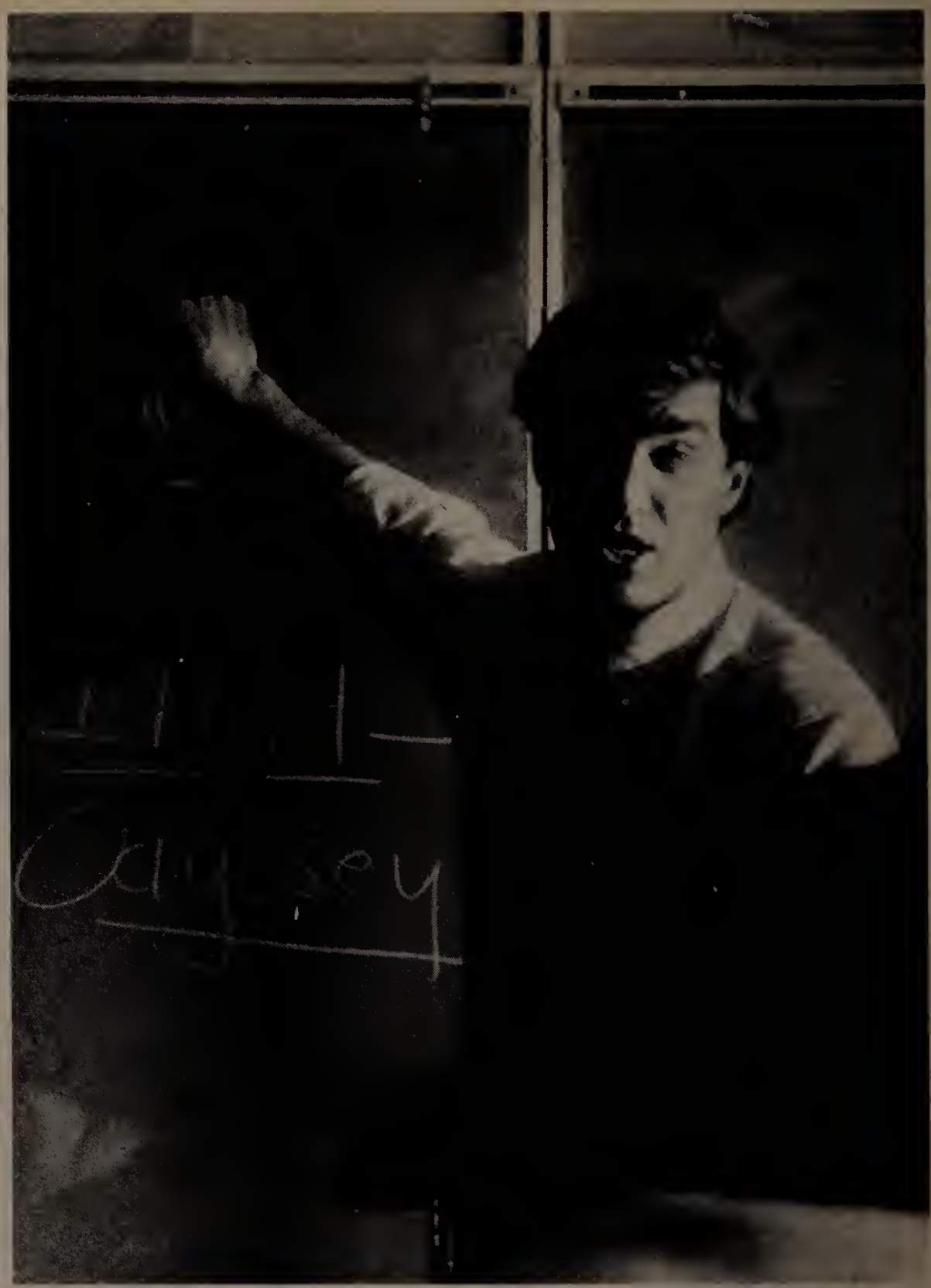

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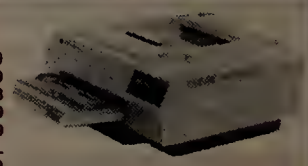

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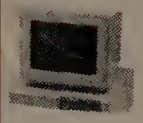

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4M8	33477A	HP Laser Jet IIP and III	229.00
1M8	334438	HP Laser Jet II and IID	109.00
2M8	334448	HP Laser Jet II and IID	159.00
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2M8	1039137	I8M Laser 4019	219.00
3.5M8	1038675	I8M Laser 4019	299.00
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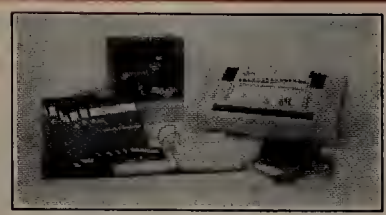

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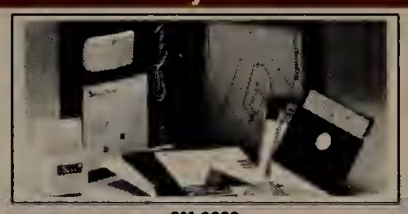

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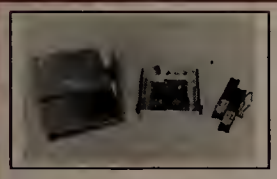

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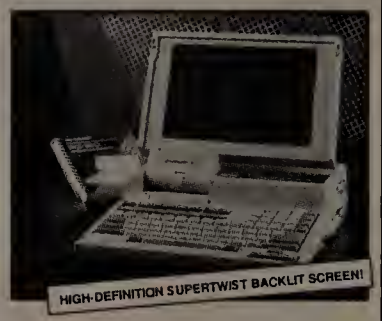

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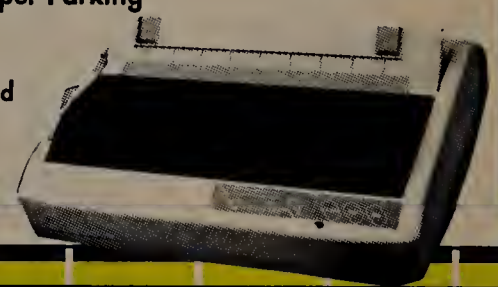

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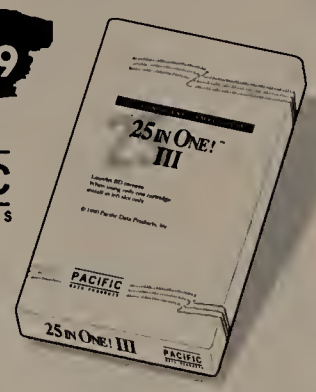

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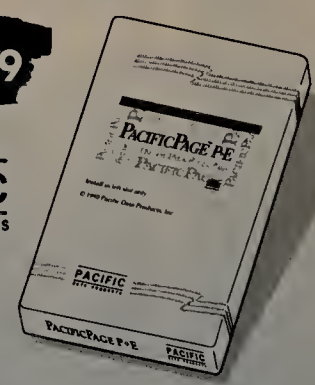

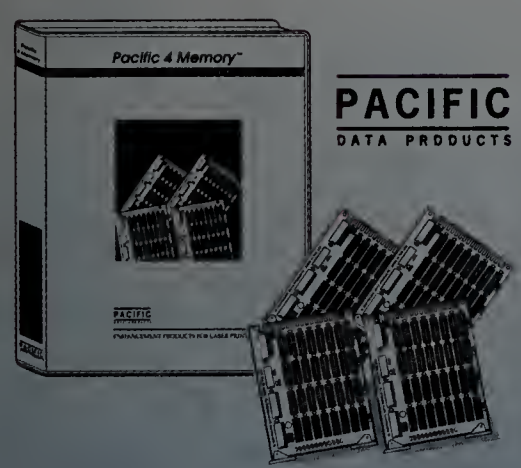

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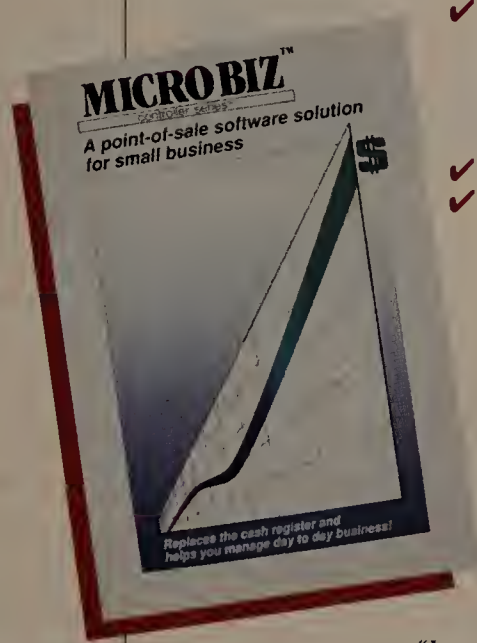

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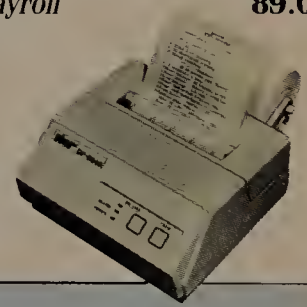

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TAKING IT HOME

The practical guide to home/office computing

Building your own integrated software

Lawrence J. Magid

Trying to do the same job at home as at the office, with fewer resources, may send you into the arms of low-cost integrated packages like *Microsoft Works*.

Typically, these programs offer scaled-down versions of the most-often-used applications—perfect if you have less memory, storage, and CPU power at your disposal, and perhaps less demanding computing needs at home as well. Integration provides a consistent interface for ease of use and easy data transfer among modules.

But that strength can be a weakness. Just because you like an integrated program's word processor doesn't mean that you're going to like its spreadsheet. In any case, you still may need to swap home files in and out of your jumbo apps at the office on a daily basis and deal with constantly changing commands.

Rather than having to buy an integrated sampler, what if you could configure your own integrated package? You could put together the two or three full-featured apps that you use all the time at the office—without the panoply of printer drivers and help and sample files that clog up your office hard disk.

Windows 3.0 does the trick on my beefed-up 386 home desktop, but I can't afford its RAM and disk overhead on my laptop, where I happen to do a lot of home computing. Fortunately, there are a couple of other options.

If you're using a 286 or even an XT, *Desqview* from Quarterdeck Office Systems lets you create an integrated environment using off-the-shelf DOS applications. The program uses only about 150K of RAM, most of which can be tucked into extended or expanded memory. You can run multiple programs in the remainder, cutting and pasting between them.

It isn't *Windows: Desqview* can't

TIM CARROLL

transfer live spreadsheet ranges, and it can't make your spreadsheet look and feel like your word processor. But its built-in macro language lets you create the same keyboard commands for your programs at work and at home. For example, as a longtime *WordPerfect* user, I've assigned <F10> as the Save key for all my programs.

If you don't need to run more than one program at a time or are short on memory, you can still achieve a high degree of interprogram integration with a stand-alone macro utility like Borland's *SuperKey*. It gives you the same macro capability as *Desqview*, but without the clipboard for data transfer.

And it still lets you write macros to move data between programs. For example, I use *WordPerfect* to create E-mail instead of using the editor in my communications program. Just about any communications program can save incoming text as an ASCII file, and all word processing programs speak ASCII. The trick is making the process seamless.

I use *WordPerfect* to write an article or letter, and then run a macro that automatically saves it as a text file in a specified directory under the name SEND.TXT. Since I always save to the same file name, I've programmed the macro to overwrite the previous version of SEND.TXT. Then I use a communications program macro with the same keystrokes to automatically transmit SEND.TXT. I achieve the same result as with a *Windows* or *Desqview* clipboard, and although I prefer the macros native to my applications, *SuperKey* can always fill in.

The concept applies to just about any combination of programs as long as they can agree on some common file format for data exchange. Integrated programs are fine, but there is nothing to prevent you from building your own macros to integrate the applications that you like most under your own personal user interface.

Lawrence J. Magid is a nationally syndicated computer columnist.

Desqview $129.95; Quarterdeck Office Systems; 213/392-9851, 213/314-3214 (fax)
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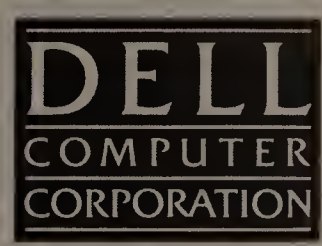

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